Chapter 3A. Affected Environment and Environmental Consequences - Water Supply and Water Project Operations

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SUMMARY

This chapter describes Delta conditions related to water supply and consumptive use in the Delta. Delta island consumptive use is the water supplied by rainfall and channel depletion that is lost from Delta islands through crop ET and open-water evaporation. The chapter provides an overview of historical Delta water supply conditions, describes the water budget for the DW project islands, discusses possible effects of the DW project on water available for export, and describes potential impacts of the DW project alternatives on consumptive use.

Possible effects of DW project operations on water supply were assessed by comparison between simulated conditions associated with the DW project alternatives and those associated with the No-Project Alternative. The Delta Standards and Operations Simulation (DeltaSOS) model was used to simulate water supply conditions; DeltaSOS modeling was based on the initial water budget developed from results of simulations performed by DWR using the operations planning model DWRSIM. The simulations were performed using the 70-year hydrologic record for the Delta tributaries but assumed that Delta operations would comply with 1995 WQCP objectives and existing SWP export limits and would operate according to DWR's estimated current level of demand. Cumulative conditions were simulated also with the 1995 WQCP objectives but included full SWP pumping capacity. Results of the DeltaSOS modeling discussed in this chapter were used as a basis for analysis of DW project effects on topics in other resource chapters of the EIR/EIS.

The DW project would be required to operate under all applicable standards for protection of Delta water quality, fish and wildlife uses, and other resources and would be precluded from interfering with the ability of those holding prior water rights to comply with Delta standards. Implementation of the DW project alternatives is expected to increase water available for annual Delta exports; however, changes in export water supply are not considered in themselves to be beneficial or adverse impacts, and these changes are described in this chapter but are not assessed for impact significance.

Implementation of Alternative 1 is expected to result in a less-than-significant increase in Delta consumptive use. Implementation of Alternative 2 is expected to result in a beneficial decrease in Delta consumptive use. Implementation of Alternative 3 is expected to result in a significant and unavoidable increase in Delta consumptive use. Under cumulative conditions, implementation of Alternative 1, 2, or 3 would result in a beneficial decrease in consumptive use.

Under the No-Project Alternative, consumptive use would increase, but not measurably so at the scale of monthly water supply modeling.

INTRODUCTION

This chapter discusses Delta conditions related to water supply (the amount of water available for beneficial uses) and the possible effects of DW project operations on water supply. Beneficial uses of Delta water include in-Delta use (e.g., crop irrigation) by other water right holders, maintenance of fish and wildlife habitat, and export to users receiving water from the CVP or the SWP. The "Affected Environment" section of this chapter discusses water rights; Delta objectives and requirements for protection of water quality and biological resources and the constraints placed on Delta water project operations by these objectives and requirements; and operations of the major water projects, the SWP and the

CVP. The section also presents an overview of the historical Delta water budget (those hydrologic terms that represent the amounts of water entering and exiting the Delta).

The impact discussion of this chapter focuses on potential DW project effects on consumptive use. This chapter does not quantify the effect of an increase of water available for beneficial uses. Direct effects of an increase of water available for annual Delta exports from the DW project alternatives are analyzed in subsequent chapters of this EIR/EIS. Chapter 3B, "Hydrodynamics", discusses potential DW project effects on channel flows and stages. Chapter 3C, "Water Quality", discusses potential DW project effects on outflow and resulting changes in water quality. Chapter 3F, "Fishery Resources", discusses the potential for fish habitat changes, increased entrainment, and other impacts resulting from project-related changes in outflow and export.

Following are definitions of the Delta boundary (systemwide) water budget terms as they are used in this EIR/EIS:

- **Inflow.** The total rate (cfs) or volume (TAF) of streamflow entering the Delta from the Sacramento and San Joaquin Rivers, Yolo Bypass, and the eastside streams.
- **Rainfall.** In-Delta precipitation.
- **Channel depletion.** The water removed from Delta channels by diversions for irrigation and by open-water evaporation.
- **Consumptive use.** Loss of water on the DW project islands and other Delta islands through crop ET and open-water evaporation and use for shallow-water management for wetlands and wildlife habitat. Rainfall and channel depletion supply the consumptive use water.
- **Exports.** The water pumped from the Delta to south-of-Delta users by DWR at Banks Pumping Plant and Reclamation at the CVP Tracy Pumping Plant and the amount diverted by CCWD at its Rock Slough intake.
- **Outflow.** The water flowing out of the Delta into San Francisco Bay.

The relationship between these water budget terms is described by the following equations:

Inflow + rainfall = consumptive use
+ exports + outflow

Channel depletion = consumptive
use - rainfall

AFFECTED ENVIRONMENT

Numerous parties hold rights to divert water from the Delta and Delta tributaries. The reasonable beneficial requirements of existing riparian and senior appropriative users with regard to both water quantity and water quality must not be impaired by exercise of subsequent appropriative water rights. DWR's SWP and Reclamation's CVP and other users divert water from the Delta under appropriative rights. Additionally, approximately 1,800 siphons are used to divert water under riparian and appropriative rights from Delta channels to Delta islands for agricultural consumptive uses; most of these appropriative rights were applied for in the 1920s and are senior to those under which the SWP and CVP operate. DW project operations would be conducted under DW's existing riparian and appropriative water rights and new appropriative rights, as described in Chapter 2, "Delta Wetlands Project Alternatives".

Various water quality and flow objectives have been established to ensure that the quality of Delta water is sufficient to satisfy all designated uses; implementation of these objectives requires that limitations be placed on Delta water supply operations, particularly operations of the SWP and CVP, affecting amounts of fresh water and salinity levels in the Delta. The DW project would be prohibited from affecting the ability of those holding prior water rights, such as DWR and Reclamation, to exercise those rights, and the DW project would not be allowed to interfere with compliance with Delta water quality standards or protection of biological resources.

Sources of Information

Ongoing studies and analyses of the Bay-Delta served as important sources of information for this analysis. Recent studies and reports include San Francisco Estuary Project (1993) and the estuarine standards proposed in December 1993 by EPA; Bay-Delta hearings and workshops sponsored by SWRCB; evaluations of effects of SWP and CVP operations on two federally listed endangered species, winter-run chinook salmon (NMFS 1993) and delta smelt (U.S. Fish and Wildlife Service [USFWS] 1995); and draft environmental documents for major water resource projects in or adjacent to the Delta, including the Los Vaqueros Project (CCWD and Reclamation 1993) and DWR's North Delta Program (DWR 1990a), South Delta Program (DWR 1990b), and Los Banos Grandes (DWR 1990c).

Major sources of data for this chapter were the "DAYFLOW" hydrologic database maintained by DWR's central district and simulation results from the monthly Delta operations planning models DWRSIM and DeltaSOS. DAYFLOW, DWRSIM, and DeltaSOS are described below under "Delta Water Supply Planning", and DWRSIM and DeltaSOS are described further under "Analytical Approach and Impact Mechanisms".

Another source of information for this chapter is the recent description and analysis of California water supply and water use demands provided in DWR Bulletin 160-93, California Water Plan Update (DWR 1994). Bulletin 160-93 describes the potential effects of environmental requirements, including Delta outflow and export limits to protect fish and wildlife species, on Delta water supply.

The environmental report prepared by SWRCB on the 1995 WQCP (SWRCB 1995) is the most recent document dealing with Delta water supply operations.

This chapter is also based on information presented in the following appendices:

- Appendix A1, "Delta Monthly Water Budgets for Operations Modeling of the Delta Wetlands Project", describes historical monthly Delta inflows and exports and the monthly Delta inflows, exports, and outflows simulated using the water supply planning model DWRSIM.

- Appendix A2, "DeltaSOS: Delta Standards and Operations Simulation Model", describes application of DeltaSOS, the water supply model developed by JSA for evaluating Delta water management operations for compliance with present and likely future Delta standards and for describing the potential effects of DW project operations on water supply.

- Appendix A3, "DeltaSOS Simulations of the Delta Wetlands Project Alternatives", presents results of DeltaSOS simulations of the DW project alternatives and the No-Project Alternative and describes the use of DWRSIM simulation results as initial water budget terms for DeltaSOS modeling.

- Appendix A4, "Possible Effects of Daily Delta Conditions on Delta Wetlands Project Operations and Impact Assessments", compares daily hydrologic conditions with monthly average conditions in the Delta. Results from the daily water supply planning model, DailySOS, are used to describe likely daily operations. The appendix discusses potential differences between impact assessment based on monthly average hydrologic conditions and impact assessment based on actual daily hydrologic conditions.

The reader is directed to these appendices for a more detailed explanation of analytical methods and assumptions for estimating water supply effects of DW project operations. Readers who are unfamiliar with Delta water supply planning issues may choose to review the appendices before reading this chapter.

Delta Water Rights

Riparian Water Rights

Riparian water rights are entitlements to water that are held by owners of land bordering natural flows of water. A landowner has the right to divert a portion of the natural flow for reasonable and beneficial use on his or her land within the same watershed. If natural flows are not sufficient to meet reasonable beneficial requirements of all riparian users on a stream, the users must share the available supply according to each owner's reasonable requirements and uses (SWRCB 1989). Natural flows do not include return flows from use of groundwater (e.g., for irrigation), water seasonally stored and later released (e.g., by the SWP or the CVP for Delta export), or water diverted from another watershed.

Appropriative Water Rights

Appropriative rights are held in the form of conditional permits or licenses from SWRCB. These authorizations contain terms and conditions to protect prior water right holders, including Delta and upstream riparian water users, and to protect the public interest in fish and wildlife resources. To a varying degree, SWRCB reserves jurisdiction to establish or revise certain permit or license terms and conditions for salinity control, protection of fish and wildlife, protection of vested water rights, and coordination of terms and conditions between the major water supply projects.

Diversion and storage of water in upstream reservoirs by California's two major water supply projects, DWR's SWP and Reclamation's CVP, and diversion and export of water from the Delta are authorized and regulated by SWRCB under appropriative water rights. The SWP and the CVP store and release water upstream of the Delta and export water from the Delta to areas generally south and west of the Delta. Reclamation diverts water from the Delta through its Tracy Pumping Plant to the Delta-Mendota Canal (DMC) and San Luis Canal, and DWR pumps for export through the California Aqueduct and South Bay Aqueduct at its Banks Pumping Plant in Clifton Court Forebay (Figure 1-2 in Chapter 1). DWR also operates the North Bay Aqueduct, which diverts water at the Barker Slough Pumping Plant. SWRCB first issued water right permits to Reclamation for operation of the CVP in 1958 (Water Right Decision 893 [D-893]) and to DWR for operation of the SWP in 1967 (D-1275 and D-1291).

A third substantial diverter of Delta water is CCWD, which currently diverts water from Rock Slough under Reclamation's CVP water rights and will be diverting water from a second intake to be constructed on Old River (CCWD and Reclamation 1993). Several municipal users and many agricultural users also divert water from the Delta under riparian and appropriative rights.

Protection of Water Quality and Biological Resources

The Delta Protection Act of 1959 declared that the maintenance of an adequate water supply for agriculture, industry, urban use, and recreation in the Delta area and for export to areas of water deficiency was necessary for people of the state. Since issuing CVP's water right permit in 1958, SWRCB has established permit terms and conditions to protect beneficial uses of Delta water. SWRCB decisions and water quality control plans and other agency requirements and proposed standards for protection of Delta resources are described below.

D-1485 and the 1978 Water Quality Control Plan

In 1978, SWRCB adopted D-1485 and the Water Quality Control Plan for the Sacramento-San Joaquin Delta and Suisun Marsh (1978 Delta Plan). D-1485 modified the Reclamation and DWR permits to require the CVP and the SWP to meet water quality standards specified in the 1978 Delta Plan. The general goal of D-1485 standards was to protect Delta resources by maintaining them under conditions that would have occurred without CVP and SWP operations. D-1485 also required extensive monitoring and special studies of Delta aquatic resources.

D-1485 and the 1978 Delta Plan were challenged in litigation that was finally decided in the "Racanelli Decision" (*United States v. State Water Resources Control Board* 182 Cal. App. 3d 82 [1986]), which directed the state to revise its standards. Pursuant to that decision, SWRCB implemented a hearing process, known as the Bay-Delta hearings, to review and amend the 1978 Delta Plan.

Suisun Marsh Preservation Agreement

SWRCB's D-1485 directed Reclamation and DWR to develop a plan to protect Suisun Marsh resources. The Suisun Marsh Preservation and Restoration Act of 1979 *authorized the Secretary of the Interior to enter into a* cooperative agreement with the State of California to protect the marsh and specified the federal share of costs for water management facilities. An agreement between federal and state agencies was signed in 1987 with the goal to mitigate the effects of CVP and SWP operations and other upstream diversions on water quality in the marsh. However, SWRCB has not yet approved this agreement. A salinity control structure (tidal gate) was completed on Montezuma Slough in 1988. Additional facilities are being planned, and operation of the facilities will be governed by the 1995 WQCP objectives and monitoring results.

Draft D-1630 and the 1991 Water Quality Control Plan

Following a lengthy hearing process, SWRCB issued revised water quality objectives in the 1991 Delta Water Quality Control Plan for Salinity, Temperature and Dissolved Oxygen (1991 Delta Plan). In 1992, SWRCB proposed new interim water right terms and conditions in draft D-1630. Although subsequently withdrawn, draft D-1630 presented several new Delta water management concepts that have been partially adopted in other actions taken by SWRCB, DWR, Reclamation, fishery protection agencies, and other regulatory agencies. Because draft D-1630 was not adopted, the revised water quality objectives of the 1991 Delta Plan have not been implemented.

Endangered Fish Species

The federal Endangered Species Act requires assessment of the effect of water project operations on fish species listed under the Endangered Species Act as threatened or endangered. NMFS issued its biological opinion on the effects of SWP and CVP operations on winter-run chinook salmon in February 1993, and USFWS issued a biological opinion on effects of SWP and CVP operations on delta smelt in March 1995. The biological opinions establish requirements to be met by the SWP and the CVP to protect these listed species. These include requirements for Delta inflow, Delta outflow, DCC gate closure, central Delta outflows (QWEST flows, described in Appendix A2), and reduced export pumping because of specified incidental "take" limits. (Take includes harassment of and harm to a species, entrainment, directly and indirectly caused mortality, and actions that adversely modify habitat.) These fish protection requirements impose important constraints on Delta water supply operations.

December 1994 Bay-Delta Framework Agreement and the 1995 WQCP

A Bay-Delta Framework Agreement was signed in June 1994 between the Federal Ecosystem Directorate and the Governor's Water Policy Council of the State of California to establish a comprehensive program for coordination and cooperation with respect to environmental protection and water supply dependability in the Bay-Delta estuary. The three major areas of agreement were:

- formulation of water quality objectives that incorporate EPA and SWRCB regulatory responsibilities,
- coordination of SWP and CVP operations that rapidly respond to environmental conditions in the Delta with an adaptive management approach, and
- evaluation and implementation of necessary facilities and operational controls to provide long-term Delta ecosystem management that integrates water supply and environmental protection objectives.

SWRCB's 1995 WQCP (adopted May 1995) and environmental appendix incorporated several elements of the EPA, NMFS, and USFWS regulatory objectives for salinity and endangered species protection. The 1995 WQCP objectives are expected to be fully implemented with a new water right decision (to replace D-1485) within the next 3 years. The 1995 WQCP objectives were used as the applicable Delta standards for simulating the DW project alternatives and the No-Project Alternative. Several of the specific objectives are discussed in Appendix A2, "DeltaSOS: Delta Standards and Operations Simulation Model", and Appendix A3, "DeltaSOS Simulations of the Delta Wetlands Project Alternatives".

Delta Water Project Operations

Coordinated Operations Agreement

Reclamation, DWR, and others have worked extensively to deal with the complexities of protecting Delta beneficial uses. For example, under interim agreements, DWR cooperatively exports ("wheels") CVP water from the Delta when excess SWP pumping capacity is available.

One product of direct negotiation between Reclamation and DWR is the Agreement between the United States of America and the State of California for Coordinated Operation of the Central Valley Project and the State Water Project. The Coordinated Operations Agreement (COA) establishes the basis for cooperative CVP and SWP operations to satisfy SWRCB objectives and provides for periodic review of CVP and SWP operations to satisfy the COA. The 1994 Bay-Delta Framework Agreement further emphasizes the cooperative operations of CVP and SWP facilities.

CALFED Operations Group

The 1994 Bay-Delta Framework Agreement established the California-Federal Operations Group referred to as CALFED to coordinate SWP and CVP operations and recommend changes in combined Delta operations that might provide additional fish protection and allow Delta exports with reduced fishery impacts. The CALFED Operations Group was specifically charged with recommending operational changes based on real-time fish monitoring results to minimize incidental take and satisfy other requirements of Endangered Species Act biological opinions. The CALFED Operations Group is also charged with the exchange of information and the discussion of strategies to implement fish protection measures, satisfy 1995 WQCP water quality objectives, and cooperate with the Interagency Ecological Program (IEP) to determine factors affecting Delta habitat and the health of fisheries and to identify appropriate corrective measures for the CVP and the SWP. The CALFED Operations Group has been meeting monthly during 1995.

Water Quality and Fishery Monitoring

DWR and Reclamation operate an extensive network of stations for monitoring Delta salinity conditions. Daily data on electrical conductivity (EC) are used to determine the response of Delta salinity conditions to changes in water supply operations and to demonstrate compliance with applicable water quality standards (see Appendix B2, "Salt Transport Modeling Methods and Results for the Delta Wetlands Project"). EC is a general measure of dissolved salts in water and is the most commonly measured water quality variable in the Delta.

Reclamation and DWR operations staffs routinely coordinate monthly planning and daily Delta operations to meet Delta objectives for municipal and agricultural uses and the protection of fish and wildlife and satisfy export pumping demands. The CVP and the SWP are obligated to follow the directives of the "reasonable and prudent" alternatives that are recommended in the biological opinions for winter-run chinook salmon and delta smelt to minimize adverse effects of project operations on these species while still achieving the water supply purposes of the projects. Fish salvage records and IEP fish monitoring data are used to guide operations.

Provisions of the CVP Improvement Act of 1992

The Central Valley Project Improvement Act (CVPIA) dedicates 800 thousand acre-feet per year (TAF/yr) of water delivery for fish and wildlife recovery and mandates the acquisition of additional water for fish and wildlife purposes. Reclamation has implemented interim changes in its Delta operations during 1993 and 1994, as recommended by USFWS, to dedicate the 800 TAF/yr. Long-term changes in CVP operations that may be required to satisfy the CVPIA are being evaluated by Reclamation and USFWS, and a programmatic EIS is expected to be published in 1995.

Delta Water Supply Planning

A large proportion of California's water supply moves through the Delta to be exported to urban and agricultural water users in the San Joaquin Valley, San Francisco Bay Area, and Southern California. Therefore, statewide water supply planning must be based on an accurate description of Delta standards and operational constraints.

Water supply conditions in California and the Delta are commonly evaluated using DWR's operations planning model, DWRSIM, or Reclamation's operations planning model, PROSIM. DWR and Reclamation use these models to simulate possible effects of increased demands, new facilities, or new standards on SWP or CVP project operations. These models simulate monthly patterns of water storage, diversion, and export based on historical hydrologic data. Figure 3A-1 shows the upstream reservoirs that are simulated in the DWRSIM and PROSIM operations planning models.

DAYFLOW is a database of daily hydrologic conditions, including measured Delta inflows and exports, estimated consumptive use, and net Delta outflow (DWR 1986). The daily data have been compiled for each water year (October 1 to September 30) beginning with 1930 and are updated annually. U.S. Geological Survey (USGS) and DWR streamflow gages are the sources of inflow measurements for the Sacramento, San Joaquin, Mokelumne, Cosumnes, and Calaveras Rivers. Yolo Bypass and several miscellaneous inflows between Sacramento and Stockton are also estimated from available streamflow gages. CVP and SWP operations records are the source of export pumping data. DAYFLOW provides an accounting of historical Delta boundary (systemwide) hydrology that is used for evaluating flow-related conditions in the Delta.

Results from DWR studies to evaluate flow requirements of the 1995 WQCP objectives using DWRSIM have been used along with results from the DeltaSOS model developed by JSA for this EIR/EIS to describe Delta conditions, standards, and water supply constraints as a basis for evaluating possible effects of DW operations. (See Appendix A2, "DeltaSOS: Delta Standards and Operations Simulation Model", for a description of the application of DeltaSOS.)

Historical Delta Water Supply and Water Quality

Because of variable hydrologic conditions, seasonal demands for water diversions, and agricultural drainage flows, water supply and water quality conditions in the Delta exhibit considerable fluctuations. Periods of high inflows that result in low salinity alternate with periods of low inflow that allow greater salinity intrusion and may allow larger effects from agricultural drainage. A second source of variation in Delta water supply and water quality conditions is CVP and SWP project operations that may store water upstream for later release and export to supply south-of-Delta demands. Existing Delta water supply conditions are described in detail in Appendix A1, "Delta Monthly Water Budgets for Operations Modeling of the Delta Wetlands Project", and existing Delta salinity conditions are described in detail in Appendix B2, "Salt Transport Modeling Methods and Results for the Delta Wetlands Project".

Figure 3A-2 shows the historical annual pattern of Delta inflow and exports and estimated annual channel depletion resulting from Delta ET losses for the 1922-1991 period, based on DWR's DAYFLOW database (1930-1991) and DWR's estimates of unimpaired flow (natural tributary inflow without storage or diversions) (1922-1929). Delta inflow that is not lost to Delta ET or pumped as Delta export is calculated as Delta outflow.

Table 3A-1 gives annual values for the historical Delta water budget terms for water years 1922-1991 based on the DAYFLOW database (1930-1991) and unimpaired flow estimates (1922-1929). Historical Delta inflow averaged approximately 23.0 million acre-feet per year (MAF/yr) for 1922-1991. Consumptive use was estimated at 1.59 MAF/yr and rainfall averaged 0.82 MAF/yr, so net Delta channel depletion averaged about 0.77 MAF/yr. Historical exports increased from less than 0.1 MAF in 1950 (CCWD diversions) to about 6 MAF in 1989 and 1990 (see details in Appendix A1).

Figure 3A-3 shows DAYFLOW estimates of monthly historical Delta outflow for water years 1968-1991, corresponding to the period when most CVP and SWP facilities were constructed and operating. Delta outflow has fluctuated greatly during this historical period, with low-flow periods of less than 5,000 cfs common in fall, and high-flow periods of greater than 50,000 cfs in winter of 13 of the 24 years.

Figure 3A-4 shows historical monthly Delta EC patterns for 1968-1991 (from EPA's STORET database) measured at Pittsburg, just upstream of Chipps Island (see Appendix B2). By comparison of Figures 3A-3 and 3A-4, it can be seen that periods of low Delta outflow correspond with major salinity intrusion episodes at Pittsburg, and periods of high Delta outflow correspond with salinity being flushed from the Delta.

IMPACT ASSESSMENT METHODOLOGY

Analytical Approach and Impact Mechanisms

DWRSIM and DeltaSOS

Possible water supply effects of alternative operations of the DW project were evaluated with the DeltaSOS model developed by JSA (see Appendix A2, "DeltaSOS: Delta Standards and Operations Simulation Model"). For assessment purposes, operations under each of the DW project alternatives (Alternatives 1, 2, and 3) were simulated using DeltaSOS, and the No-Project Alternative was simulated with DeltaSOS to provide a baseline condition, including the same Delta operating conditions, with which DW operations under each alternative could be compared. The lead agencies (SWRCB and the Corps) determined that the simulations for this EIR/EIS assessment should be performed assuming implementation of the 1995 WQCP objectives as interpreted by DWR for modeling the Delta water supply effects of the WQCP using DWRSIM. The lead agencies consider the DWRSIM results to be the best available representation of likely future Delta conditions under the 1995 WQCP objectives.

As described in Chapter 3, "Affected Environment and Environmental Consequences - Overview of Impact Analysis Approach", the simulations were therefore performed based on the assumption that operations of the DW project and the No-Project Alternative would be within the 1995 WQCP objectives for Delta outflow and Delta export limits and would be consistent with current Corps limits on SWP pumping (6,680 cfs). For assessment of cumulative impacts, DeltaSOS simulations were also performed for operations that would be within the 1995 WQCP objectives, but allowing for SWP export pumping at the full physical capacity of 10,300 cfs for Banks Pumping Plant.

Because the 70-year hydrologic record for the Delta tributaries is the best available description of likely future hydrologic conditions, hydrologic data from this record serve as the basis of simulations of future Delta operations. The results of the simulations are therefore shown as corresponding to the water years of the hydrologic record (1922-1991) and represent estimates of operations under hydrologic conditions replicating those of this period of record.

DeltaSOS simulations require an initial Delta water budget, user-specified input parameters (switches) that govern simulated Delta operations, and specified matrices of Delta standards. As described below under "Simulated 1995 WQCP Objectives", simulation results from the DWRSIM monthly water supply planning model provided the initial water budget terms for the DeltaSOS simulations. DWR performed these simulations, referred to as DWRSIM study 1995-C6B-SWRCB-409, in January 1995 to represent the 1995 WQCP objectives. The specified model inputs for the DW project simulations are described in Appendix A3, "DeltaSOS Simulations of the Delta Wetlands Project Alternatives". Selected results are presented in tables and graphs in Appendix A3 to compare each simulated DW alternative with the No-Project Alternative; results of the DWRSIM and DeltaSOS model studies are summarized in this chapter.

Simulated 1995 WQCP Objectives

The DWRSIM simulation used for estimating the initial Delta water budget used in the DeltaSOS simulations represented the 1995 WQCP objectives based on assumptions summarized below. The DWRSIM modeling assumptions necessary to represent the 1995 WQCP objectives in a monthly water supply planning model have been described in detail in SWRCB (1995). More complete descriptions of these DWRSIM and DeltaSOS modeling assumptions are presented in Appendices A1, A2, and A3.

Following are major DWRSIM assumptions for the 1995 WQCP simulations:

- Upstream hydrology, depletions, and diversions were based on 1995 level of development, as presented in California Water Plan Update (DWR 1994). See Appendix A1 for more details.

- Water-year classification was based on the "40-30-30 Sacramento Valley Four-River Index" and the "60-20-20 San Joaquin Valley Four-River Index". The outflow requirements during February-June depend on the previous month's "Eight-River Index" runoff volume. These classification schemes are slightly different from those used for the standards specified in D-1485, which established the Delta operations criteria in effect until approval of the 1995 WQCP.

- Delta outflow requirements were the combination of fixed monthly requirements, estuarine habitat requirements (expressed in terms of "X2", the position of the 2-parts-per-thousand [2-ppt] salinity gradient), and requirements for additional outflow to protect the chloride objective of 250 milligrams per liter (mg/l) for Delta exports. Because the X2 requirements in the 1995 WQCP depend on the previous month's runoff, the required outflow must be calculated for each month. Minimum outflow objectives are maintained during low runoff periods.

- The CVP Delta export demand was assumed to be 3.15 MAF/yr, including 145 TAF/yr for CCWD diversions. However, these CVP demands were not always satisfied in drier years in DWRSIM simulations. The SWP Delta export demands were assumed to vary with Kern River runoff and Los Angeles rainfall conditions. The range of possible SWP export demands was 2.6-3.6 MAF/yr, with an average of 2.85 MAF/yr. The maximum combined Delta export demand of 6.7 MAF/yr was specified in about 45% of the simulated years. The simulated average annual Delta export, based on these variable demands, was 5.7 MAF/yr, with 2.8 MAF/yr simulated as SWP and delivery and 2.9 MAF/yr as CVP delivery. See Appendix A3 for more details.

- San Joaquin River inflows, estimated with another DWR model called STANSIM, met the 1995 WQCP Vernalis water quality objectives (with a maximum of 70 TAF/yr), and the Vernalis pulse-flow objectives were satisfied with additional water from upstream tributaries (Tuolumne and Merced Rivers) when necessary. This additional San Joaquin River inflow averaged 72 TAF/yr but was required in only a few years. See Appendix A3 for more details.

- Combined SWP and CVP Delta exports were limited as specified in the 1995 WQCP to a percentage of the simulated Delta river inflow (which does not include rainfall). These percentages are 35% in February-June and 65% for the remainder of the year. The February percentage is 45% if the January Eight-River Index is less than 1.0 MAF. Export pumping during the pulse-flow period was limited to an amount equivalent to the pulse flow during half of April and half of May. See Appendix A2 for details.

Simulated Delta Water Supply Conditions

Possible effects of the DW project on Delta water supply conditions were assessed through comparison of simulated conditions under the DW project alternatives with those under the No-Project Alternative. Delta water supply under existing conditions, which include agricultural land uses on the DW project islands, is similar to water supply under the No-Project Alternative; the estimated changes in consumptive water use between the existing agricultural land uses and the intensified agricultural uses under the No-Project Alternative (estimated to be as much as 30 TAF/yr, as shown in Table 2-2 in Chapter 2) are not measurable at the scale of monthly water supply modeling. Therefore, rather than presenting two lists of the same values for existing Delta water supply conditions and the No-Project Alternative conditions, this section describes the simulation results for the No-Project Alternative.

Appendix A3 includes details of annual and monthly values for Delta conditions simulated by DeltaSOS for the No-Project Alternative. Annual values summarize annual variations but do not show monthly fluctuations. Monthly percentile tables in Appendix A3 provide an important seasonal summary of simulated Delta conditions for the No-Project Alternative.

Table 3A-2 summarizes simulated average annual DW project operations under the No-Project Alternative, showing DeltaSOS-adjusted exports, required outflow, and effects on export and outflow and major channel flows. Tables 3A-3 and 3A-4 show DeltaSOS average simulation output for Delta exports and outflow under the No-Project Alternative. Selected simulation results are summarized in graphs in this chapter and are described below.

Monthly Simulation of Maximum SWP and CVP Exports. The only adjustment that DeltaSOS makes to the initial DWRSIM results is to increase the combined CVP and SWP exports to the maximum possible within the constraints specified in the 1995 WQCP.

DeltaSOS simulations indicate that a considerable amount of Delta export would be possible in addition to that simulated by DWRSIM for its variable assumption of south-of-Delta demands (see Appendix A1). The additional simulated SWP and CVP exports average 442 TAF/yr. These additional exports are simulated in DeltaSOS to provide an appropriate basis for estimating potential water supply effects of the DW project. Only water that could not have been exported directly by the SWP or the CVP was simulated to be available for DW diversions. Only export pumping capacity that could not have been used by the CVP and the SWP because of the 1995 WQCP export limits was simulated to be available for export pumping (wheeling) of DW discharges.

The DeltaSOS adjustment of the initial DWRSIM Delta exports is fully described in Appendix A3. This assumption of maximum CVP and SWP exports within the export limits specified in the 1995 WQCP may result in more Delta export being simulated than could be fully used in some years. It seems likely that in the event that more water were needed for south-of-Delta beneficial uses than simulated with DWRSIM, SWP or CVP export pumping of available water in the Delta would occur prior to discharge from DW storage. Additional discussion of these SWP and CVP export adjustments can be found in Appendix A3.

Monthly Simulation Values for Outflow, Export, and Water Available for DW Diversions. Figure 3A-5 shows monthly Delta outflow and required Delta outflow simulated by DeltaSOS for the No-Project Alternative under the 1995 WQCP objectives for 1968-1991. Simulated outflow values for 1922-1967 are shown in Figures A3-1A and A3-1B in Appendix A3. In many months of most years, a considerable portion of Delta outflow is represented by required Delta outflow, which includes DWRSIM estimates of X2 and requirements for "carriage water" (additional Delta outflow required to maintain acceptable chloride concentrations in export water as Delta exports are increased) (see details in Appendix A2).

Figure 3A-6 shows the DeltaSOS-simulated monthly Delta export pumping for water years 1968-1991 for the No-Project Alternative. The initial export values from DWRSIM have been adjusted by DeltaSOS to estimate additional exports that could be made within specified monthly export limits and Delta outflow objectives (without considering south-of-Delta demands and storage capacity). DeltaSOS often simulates additional export in spring because DWRSIM-simulated exports are less than the maximum possible if demands are satisfied and San Luis Reservoir storage is full. Table 3A-4 presents monthly percentiles of the DeltaSOS simulations showing the monthly distribution of Delta exports for the 70-year simulation period for the No-Project Alternative. Monthly percentiles indicate the fraction of years that a cell value (export rate) would be less than that value. For example, the average October export was simulated to be below 11,280 cfs in 70% of years, and the minimum export rate was simulated to be 4,288 cfs.

Figure 3A-7 shows simulated monthly values of water available for DW project diversions for the 1968-1991 period under the 1995 WQCP objectives. The maximum monthly average diversion rate needed to fill the 238-TAF capacity of the two DW reservoir islands is 4,000 cfs. Because the monthly average flow of available water is often greater than 4,000 cfs, the DW project would divert only a small portion of the available water in most months.

Annual Simulation Values for Outflow and Export. Figure 3A-8 shows simulated annual values for Delta outflow and required Delta outflow (in MAF) for the No-Project Alternative for water years 1922-1991 under the 1995 WQCP objectives. Some years were simulated to have very little surplus Delta outflow, whereas other years were simulated to have several MAF of surplus outflow.

Figure 3A-9 shows the annual values for DWRSIM-simulated Delta exports (from DWRSIM results) and the DeltaSOS-adjusted Delta exports (that satisfy all standards and criteria but export all available water) for the No-Project Alternative for water years 1922-1991. The average annual adjusted CVP and SWP exports totaled 6.15 MAF. DeltaSOS simulated some years having no additional export pumping, whereas other years were simulated to have more than 1,000 TAF (1 MAF) of additional export beyond the amount simulated by DWRSIM. DeltaSOS simulated total possible export for most years to be less than 7 MAF; 1958, 1975, 1982, and 1983 were the only years with simulated adjusted exports of more than 7.5 MAF/yr. Each of the DW alternatives was simulated and compared with these DeltaSOS-adjusted Delta conditions simulated for the No-Project Alternative. The simulated values are shown in Figures 3A-10 through 3A-12, and comparisons are discussed below.

Measures of Potential Water Supply Effects and Criteria for Determining Impact Significance

Several issues related to potential water supply effects were considered as impact assessment variables. Some of these could be simulated with the water supply planning models, whereas others could only be qualitatively assessed.

Full evaluations of potential environmental impacts on hydrodynamics, water quality, and fisheries were performed using the simulated monthly changes in Delta conditions associated with the DW project. The results of these impact assessments are presented in Chapters 3B, 3C, and 3F, respectively.

For purposes of this EIR/EIS, the DW project is analyzed without consideration of subsequent environmental effects caused by the delivery of purchased DW water or by the storage of water under a third party's water rights because the identity of the end user of the DW water remains speculative. The DW project could be used for interim storage of water being transferred through the Delta from sellers upstream to buyers served by Delta exports or as interim storage for water owned by parties other than DW for use to meet scheduled outflow requirements (water transfers and water banking). Under this EIR/EIS, the DW project would yield a water supply based only on water stored under its own appropriative permits and subsequently conveyed to Delta channels. A separate entity purchasing DW water could divert that water from Delta channels and export it, probably through CVP or SWP facilities, for direct use or to increase groundwater or surface water storage, or could use water for estuarine or Delta beneficial uses (increased outflow). The purchasing entity would affect SWP or CVP operations to the same extent as would any entity that wheels water under California Water Code provisions and contracts authorized by those provisions. A number of opportunities exist to operate the DW project conjunctively with the CVP and SWP, but these arrangements remain speculative and are beyond the scope of this EIR/EIS. Delivery of purchased DW water or temporary storage of water being transferred through the Delta may be subject to further environmental review.

The actual purchaser of DW project water and actual contractual arrangements with major water supply project operators have not been identified. DW project operations could be adjusted as necessary to be integrated with any contractor-purchaser's operating criteria. The contractor-purchaser and associated operations might be changed from time to time, reflecting future water demands, Delta conditions, and Delta operating requirements. However, DW project effects on potential purchasers of DW project water were not used as criteria for assessing impact significance.

Delta Water Rights

Project permits granted by SWRCB would require that project diversions not interfere with the diversion and use of water by other users with riparian or prior (senior) appropriative rights. Many riparian and appropriative water right holders are located upstream of the Delta in the Sacramento River and San Joaquin River Basins. A large number of riparian water diversions are located in the Delta. DWR, Reclamation, CCWD, and several smaller diverters hold senior appropriative water rights.

DWR Division of Operations and Maintenance, in cooperation with Reclamation's CVOCO, maintains daily water budget estimates for the Delta and designates the Delta condition each day as being "in balance" or "in excess" relative to all SWRCB objectives and water right terms and conditions. When the Delta condition is designated by DWR (with possible review by the CALFED Operations Group) to be in balance, all Delta inflow is determined to be required to meet Delta objectives and satisfy diversions by CCWD, the CVP, the SWP, other senior water right holders, and Delta riparian water users. Therefore, when the Delta is in balance, additional water would not be available for diversion by the DW project.

When DWR determines the Delta condition to be in excess, the DW project could be allowed to divert available excess water for storage on the reservoir islands. The daily quantity of available excess water would be estimated by DWR according to DWR's normal accounting procedures. To provide extra protection for compliance with 1995 WQCP Delta objectives and for existing water right holders, SWRCB may establish requirements for amounts of water within the designated excess water (i.e., buffers) that would not be available for DW diversions. Nevertheless, considerable excess Delta inflow would be available for diversion by the DW project during certain periods, especially major runoff events (Figure 3A-7).

DW project operations would not be permitted to interfere with senior appropriative water right holders or Delta riparian users. Any water right permits granted would contain terms and conditions regarding coordination with Delta operations conducted by DWR and Reclamation.

Although any interference with other riparian or prior appropriative water rights by the DW project alternatives would be considered a significant impact, SWRCB terms and conditions for DW project operations would not allow such interference with other riparian or prior water rights. Because DeltaSOS simulations of the DW alternatives were constrained to preclude interference with any riparian or prior appropriative rights, it is presumed that the DW project would have no significant impacts related to interference with prior water rights. No criteria for determining impact significance were selected and potential effects of the DW project on prior water rights are not discussed further in the impact assessment.

Compliance with Delta Objectives and Requirements

Water Quality and Biological Resources. Existing and any future Delta water quality objectives or requirements for protection of fish and wildlife and other purposes, as adopted by SWRCB or other regulatory agencies, will be applicable to the DW project. DW project operations as conditioned and limited by permits would not be allowed to violate or interfere with compliance by others with applicable Delta water quality objectives or fish and wildlife requirements.

Permits granted by the lead agencies to DW would specify terms and conditions for allowable project operations related to water quality or fish and wildlife requirements. SWRCB terms and conditions for the requested DW water rights would specify the DW operational rules and criteria related to compliance with applicable Delta objectives and requirements.

DeltaSOS simulations of the No-Project Alternative and the DW project alternatives accounted for constraints by all 1995 WQCP objectives and operations criteria that can be interpreted on a monthly basis. The DW project therefore would not adversely affect compliance of Delta water management operations with Delta objectives.

Although any violation of applicable Delta objectives caused by the DW project would be considered a significant impact, SWRCB terms and conditions for DW project operations would not allow violation of Delta objectives. Therefore, it is presumed that none of the DW project alternatives would result in significant impacts related to violating Delta objectives. Therefore, no criteria for determining impact significance were selected and compliance of the DW project with applicable Delta objectives is assumed and is not discussed further in the impact assessment.

Delta Outflow. A general effect of the DW project diversions would be to reduce Delta outflow during periods of surplus outflow (i.e., outflows greater than those required to satisfy applicable outflow objectives) for the period of several weeks when project diversions would occur. It is also possible that a purchaser of stored DW water could use the water to increase Delta outflow for fisheries or estuarine habitat management purposes. DW project diversions are potentially substantial (maximum monthly average of 4,000 cfs), and simulated reductions in Delta outflow during periods of DW diversions can be identified in the monthly planning model results.

The 1995 WQCP objectives specify monthly minimum Delta outflows, as flows necessary for fish transport, as flows necessary to prevent salinity intrusion at agricultural control locations during the irrigation season and at water supply intakes throughout the year, or as flows necessary to maintain the X2 salinity gradient location.

As discussed above, SWRCB terms and conditions for DW project operations would not allow violation of Delta outflow requirements. DW project effects on Delta outflow were not used as criteria for assessing water supply impact significance because it was presumed that the specified 1995 WQCP objectives adequately protect beneficial uses related to outflow. Potential effects of augmenting Delta outflow with purchased DW water during periods of reduced flows are expected to be generally beneficial. Because outflow can affect water quality and estuarine fish habitat, these potential impacts are evaluated in Chapter 3C, "Water Quality", and Chapter 3F, "Fishery Resources".

Delta Water Project Operations

Upstream Reservoir Storage. DW operations may influence upstream reservoir storage by the CVP or the SWP if these projects purchase DW water as replacement for upstream reservoir releases. The general effect of using DW storage water as replacement for upstream reservoir releases would be to maintain slightly higher reservoir levels throughout the summer and fall when reservoirs typically draw down. Minimum streamflows below these reservoirs are regulated by instream flow requirements, and streamflows would not be reduced below these minimums by CVP or SWP use of DW water as replacement for upstream reservoir releases.

DWRSIM does not have the capability to simulate operations of a Delta storage facility and DeltaSOS does not simulate upstream reservoir operations. Potential effects of DW operations on upstream reservoir storage could not be directly simulated and evaluated. Therefore, DW project effects on upstream reservoir storage were not used as criteria for assessing impact significance. Qualitative assessment indicates that the potential effects on upstream reservoir storage increases would be beneficial but that there may be negative effects on instream flows below reservoirs.

Delta Exports. As described in Chapter 2, "Delta Wetlands Project Alternatives", the major purpose of the DW project is to divert surplus Delta inflows, transferred water, or banked water for later sale and/or release for Delta export or to meet water quality or flow requirements. Although one of the possible uses of DW project water could be augmenting Delta outflow, the more likely use is increasing the supply of high-quality Delta exports for beneficial use in the CVP and SWP service areas.

Potential increases in Delta exports were the major water supply effects evaluated using the DWRSIM and DeltaSOS models. Annual and seasonal effects on export water supply are described in this chapter. Related impacts on hydrodynamics, water quality, and fishery resources are evaluated in Chapters 3B, 3C, and 3F, respectively. Because the lead agencies do not consider the addition or reduction of export water supply, by itself, as a beneficial or adverse impact, no criteria can be established to assess the significance of the impact. Therefore, DW project effects on export water supply were not used as criteria for assessing impact significance.

Daily CVP and SWP Operations. The DW project would be operated in response to daily changes in hydrologic, water quality, and fishery conditions. The DW project is designed to operate once all applicable Delta objectives are satisfied. If CVP and SWP compliance with Delta objectives is based, however, on fixed-period or moving averages, DW diversions during storm-related flows might reduce allowable CVP and SWP export pumping following the storm. SWRCB will establish terms and conditions for operating the DW project to address these daily operations issues and prevent DW operations from interfering with otherwise allowable CVP and SWP operations.

To assess the effects of short-term changes in Delta conditions on DW project operations, DeltaSOS was modified to simulate Delta conditions with a daily time step. A description of the daily model (DailySOS) and a discussion of the results from the model are presented in Appendix A4, "Possible Effects of Daily Delta Conditions on Delta Wetlands Project Operations and Impact Assessments". The daily model was used for simulating project operations and water supply effects in response to short-term hydrologic fluctuations.

Potential impacts on water quality and fisheries were not directly simulated at a daily time step, however, because available information is not sufficient to allow accurate assessment of these potential daily effects. Therefore, DW project effects on daily Delta flows were not used as criteria for assessing impact significance. The magnitude of DW diversions and discharges simulated using the daily model were compared with the monthly model estimates to confirm that potential water quality and fishery impact estimates that were based on monthly model results are similar to likely daily estimates. While effects may be larger on particular days, the monthly average effect is likely to be similar to the estimates based on monthly average DW operations.

Delta Consumptive Use

The four DW project islands have existing riparian and appropriative water rights to use a reasonable quantity of water from Delta channels for agricultural and other beneficial purposes. As described in Appendix A1, "Delta Monthly Water Budgets for Operations Modeling of the Delta Wetlands Project", the water budget for continuing agricultural use of the DW islands under the No-Project Alternative was based on DWR estimates for riparian water use on Delta lowlands. Delta riparian water use is factored into simulations performed using the water supply planning models (DWRSIM and DeltaSOS). Estimates for the No-Project Alternative water budget consist of approximately 77 TAF of combined diverted and seepage water, 23 TAF of rainfall onto the four DW project islands, and approximately 56 TAF of drainage water off the DW project islands, with a net consumptive use of about 44 TAF (Table A1-8 in Appendix A1, Table 3A-5).

Under DW project operations, consumptive water use would generally shift from irrigation diversions and crop ET with minor amounts of open-water evaporation to open-water evaporation during periods of storage on the reservoir islands and the seasonally flooded portions of the habitat islands with minor amounts of irrigation diversions and crop ET.

A project alternative is assumed to have a significant detectable impact on Delta consumptive use if it would cause an increase in Delta lowland ET exceeding 1% of the No-Project Alternative ET from Delta lowlands (890 TAF/yr) (Table A1-7 in Appendix A1). This assumed significance criterion could also be expressed as a change of greater than 20% of the consumptive use on the DW islands (44 TAF/yr) because the DW islands represent about 5% of the area of the Delta lowlands (Table A1-8 in Appendix A1). A project is considered to have a beneficial effect on Delta consumptive use if it would cause a decrease in Delta lowland ET.

IMPACTS AND MITIGATION MEASURES OF ALTERNATIVE 1

Alternative 1 involves potential year-round diversion and storage of surplus water on Bacon Island and Webb Tract (reservoir islands). Bouldin Island and Holland Tract (habitat islands) would be managed primarily as wildlife habitat.

Under Alternative 1, DW diversions could occur in any month with surplus flows. In DeltaSOS modeling, it is assumed that discharges of water from the DW project islands would be exported in any month when unused capacity within the permitted pumping rate exists at the SWP and CVP pumps and strict interpretation of the 1995 WQCP "percent inflow" export limits do not prevent use of that capacity. Such unused capacity could exist when the amount of available water (i.e., total inflow less Delta channel depletion and Delta outflow requirements) is less than the amount specified by the export limits.

Water would be diverted to the reservoir islands (238-TAF water storage capacity) at a maximum monthly average diversion rate of 4,000 cfs, which would fill the two reservoir islands in one month. The maximum daily average diversion rate would be 9,000 cfs during several days when siphoning of water onto empty reservoirs begins; at this time, the maximum head differential would exist between island bottoms and channel water surfaces. The maximum daily average discharge rate would be 6,000 cfs, but the maximum monthly average discharge rate is assumed to be 4,000 cfs, allowing the two reservoir islands to empty in one month. Additional fishery protection measures may further limit DW operations (see Chapter 3F, "Fishery Resources").

Water management on the habitat islands would be slightly different from irrigation and drainage practices under the No-Project Alternative. Table A1-8 (in Appendix A1) gives the estimated monthly water budget terms for the DW habitat islands. Maximum diversion would occur in July, with an estimated diversion flow of 60 cfs (3.6 TAF). Maximum drainage would occur in January, with an estimated drainage flow of 42 cfs (2.5 TAF), assuming average rainfall. These diversions and drainage flows would not substantially change the DeltaSOS-simulated operations of the DW reservoir islands as described in this chapter.

Chapter 2, "Delta Wetlands Project Alternatives", presents a more complete description of DW project facilities and operations. Appendix A3, "DeltaSOS Simulations of the Delta Wetlands Project Alternatives", presents monthly average approximations of DW project operations under Alternative 1.

Delta Water Supply Simulations

Table 3A-2 summarizes simulated average annual DW project operations under Alternative 1, showing DeltaSOS-adjusted exports; required outflow; DW diversions and discharges for export; and effects on export, outflow, and major Delta channel flows. The volume of available water diverted to storage under Alternative 1 would be equivalent to reductions in Delta outflow. As discussed above under "Delta Outflow" in the section "Measures of Potential Water Supply Effects and Criteria for Determining Impact Significance", DW project diversions would not cause violations of applicable Delta objectives. Furthermore, any water right permit granted by SWRCB would not allow reductions in Delta outflow that violate these objectives. Detailed information on simulated changes in Delta outflow is presented in Appendix A3.

Simulated DW operations for Alternative 1 consisted of average diversions of 222 TAF/yr and average discharges for export of 188 TAF/yr. Table 3A-6 gives the average annual values simulated by DeltaSOS for Delta conditions under Alternative 1. Table A3-7 in Appendix A3 gives the monthly DeltaSOS results for Alternative 1.

The DW project was simulated as operating minimally or not at all in several years because of limited availability of water for diversions. In other years, the annual diversion for storage was simulated to be greater than the 238-TAF reservoir capacity because of multiple diversion and discharge sequences in the same year. For example, the maximum annual diversion simulated for Alternative 1 was 522 TAF in water year 1982, produced by two separate reservoir filling periods. These simulated multiple fillings may not occur if there are not demands for the DW water in these wet years.

Simulated DW discharges for export increase Delta exports. No discharges were simulated in some years because of limited volumes of stored water on the reservoir islands. In other years, the DW discharge for export was simulated to be greater than the 238-TAF reservoir storage capacity, again because of multiple diversion and discharge periods in the same year. The maximum annual discharge simulated for Alternative 1 was 444 TAF in water year 1957. Some of these large simulated discharges for export were for wet years; however, there may not be demands for DW water during such years.

Figure 3A-10 shows annual DW diversions and DW discharges for export. In many years, diversions were slightly greater than discharges, reflecting evaporation losses. In other years, diversions were much greater than discharges, indicating carryover storage on reservoir islands. Diversions in the subsequent years were much less than discharges.

Table 3A-7 gives the monthly percentiles of the DeltaSOS simulations for Alternative 1. The first panel of monthly percentiles shows the pattern of simulated DW diversions (in cfs) for each month. Diversions in a month are simulated in only about 10%-20% of the years because water may not be available for diversion or the reservoir islands may already be full. The mean diversion rate for each month indicates the overall importance of that month in terms of DW diversions. Most diversions were simulated to occur in October-January, and some were simulated to occur in February, March, and September. Almost no diversions are simulated in April-August.

The second panel shows monthly percentiles for end-of-month storage (in TAF) on the reservoir islands. The simulations indicate that the reservoir islands would generally be filled during winter, when water is available, and emptied during summer, when water could be exported.

These monthly "stacks" are the distribution of DW storage values for the 70 simulated years, given in 10% increments (7 years) and do not represent a sequence of DW storage values. The sequence of storage values can be found in Table A3-7 in Appendix A3. The monthly distribution gives an overview of the expected DW operations in a particular calendar month. For example, simulated DW storage for the end of September was empty in 80% of the years. Simulated storage for the end of October was empty in 60% of the years, and for the end of November was empty in 50% of the years. The DW storage would be full during winter in the majority of years, until export capacity was available in summer. Simulated storage for the end of March was empty in only 10% of the years and was full (238 TAF) in about 60% of the years. At the end of August, some DW storage water (80-238 TAF) was simulated to remain in only about 10% of the years.

The third monthly percentile panel shows the simulated pattern of DW discharges for export (in cfs) for each month. Discharges in a month are simulated in only about 20% of the months because there is no water in DW storage, or additional pumping capacity may not be available for export of DW discharges. The mean simulated discharge rate for each month indicates the overall importance of that month in terms of DW discharges. Most DW discharges were simulated to occur in July and August, and some discharges were simulated in other months.

No DW releases for Delta outflow were simulated for the DW project alternatives (see fourth panel); water is assumed to be held in storage until it can be discharged for export.

The fifth panel of Table 3A-7 presents simulated monthly percentiles for Delta export pumping (in cfs), including export of DW discharges, for each month. DW discharge for export would occur during months when SWP and CVP export pumping is limited by the 1995 WQCP objectives.

Appendix A3 presents detailed simulation results for Alternative 1. Appendix A4 discusses the possible differences between these monthly average simulations and likely daily DW operations.

Effects on Delta Consumptive Use

Under Alternative 1, land uses would change from irrigated agriculture to primarily water storage on the reservoir islands and to wildlife habitat on the habitat islands. These land use changes would reduce ET from a total of 44 TAF/yr to 14 TAF/yr (estimated ET from the habitat islands) for the four islands. Additionally, an average of approximately 34 TAF/yr of evaporation would be lost from stored water on the reservoir islands during periods of water storage (Table 3A-5). An unknown amount of ET from moist soil and possibly from seepage would continue to be lost on the reservoir islands directly after total drawdown. Also, an ET amount approximately equal to the ET for the habitat islands (14 TAF) would be lost during periods when the reservoir islands are in a shallow-water wetland condition.

Total consumptive use on the four DW project islands is expected to increase by approximately 4 TAF/yr compared with use under the No-Project Alternative as a long-term average.

Summary of Project Impacts and Recommended Mitigation Measures

Impact A-1: Increase in Delta Consumptive Use. Implementation of Alternative 1 would increase consumptive use by approximately 4 TAF/yr compared with consumptive use under the No-Project Alternative. This impact is considered less than significant for Delta water supply.

Mitigation. No mitigation is required.

IMPACTS AND MITIGATION MEASURES OF ALTERNATIVE 2

Alternative 2 represents DW operations with two reservoir islands (Bacon Island and Webb Tract) and two habitat islands (Bouldin Island and Holland Tract).

Under Alternative 2, DW diversions could occur in any month with surplus flows, as under Alternative 1. In DeltaSOS modeling, it is assumed that discharges from the DW project islands would be exported in any month when unused capacity within the permitted pumping rate exists at the SWP and CVP pumps. Under this alternative, DW discharges would be allowed to be exported in any month when such capacity exists and would not be subject to strict interpretation of the 1995 WQCP "percent inflow" export limits. Export of DW discharges would be limited by Delta outflow requirements and the permitted combined pumping rate of the export pumps but would not be subject to strict interpretation of the "percent inflow" export limit. Additional fishery protection measures may further limit DW operations (see Chapter 3F, "Fishery Resources").

The maximum monthly average diversion rate to reservoir island storage would be 4,000 cfs (maximum initial daily average diversion rate of 9,000 cfs). The maximum monthly average discharge rate is assumed to be 4,000 cfs (maximum daily average discharge rate of 6,000 cfs). Water management for the habitat islands would be the same as described under Alternative 1. Alternative 2 is more fully described in Chapter 2.

Delta Water Supply Simulations

Table 3A-2 summarizes simulated average annual DW project operations under Alternative 2, showing DeltaSOS-adjusted exports; required outflow; DW diversions and discharges for export; and effects on export, outflow, and major Delta channel flows. Average annual reductions in Delta outflow associated with this alternative would be equivalent to the volume of diversions but would not cause violations of applicable outflow standards.

Table 3A-8 indicates that average annual values for simulated DW operations under Alternative 2 were 225

TAF/yr of diversions and 202 TAF/yr of discharge for export. Table A3-10 in Appendix A3 gives the DW monthly simulation results for Alternative 2.

Table 3A-9 shows the monthly percentiles of DW operations for Alternative 2. Diversions were simulated to occur generally during September-March, and discharges were simulated to occur during the middle (February-March) or late part of the water year (May-July).

Figure 3A-11 shows the simulated annual DW diversions and DW discharges for export for Alternative 2. The patterns of years of multiple reservoir island fillings, carryover storage years, and years with no diversions or discharges are similar to those for Alternative 1.

Appendix A3 presents detailed simulation results for Alternative 2. Appendix A4 discusses the possible differences between these monthly average simulations and likely daily DW operations.

Effects on Delta Consumptive Use

Under Alternative 2, habitat island ET is estimated to average 14 TAF/yr, as under Alternative 1, and evaporation of stored water would average approximately 23 TAF/yr, somewhat less than for Alternative 1 because of decreases in storage duration (Table 3A-5). Total consumptive use under Alternative 2 is estimated to average approximately 7 TAF/yr less than under the No-Project Alternative.

Summary of Project Impacts and Recommended Mitigation Measures

Impact A-2: Reduction in Delta Consumptive Use. Implementation of Alternative 2 would decrease consumptive use by approximately 7 TAF compared with consumptive use for the No-Project Alternative. This impact is considered beneficial to Delta water supply and will result in reduced diversions during the irrigation season.

Mitigation. No mitigation is required.

IMPACTS AND MITIGATION MEASURES OF ALTERNATIVE 3

Alternative 3 involves storage of water on Bacon Island, Webb Tract, Bouldin Island, and Holland Tract, with secondary uses for wildlife habitat and recreation. The portion of Bouldin Island north of SR 12 would be managed as a wildlife habitat area and would not be used for water storage. Diversions to the reservoir islands (406-TAF capacity) would be allowed during any month with available surplus flows. The diversion and discharge operations for Alternative 3 would be the same as for Alternative 2, but the assumed diversion and discharge rates are higher. The maximum monthly average diversion rate would be about 6,000 cfs, which would fill the four reservoir islands in about one month (maximum daily average initial diversion rate of 9,000 cfs). The maximum monthly average discharge rate is assumed to be 6,000 cfs (maximum daily average discharge rate of 12,000 cfs).

Delta Water Supply Simulations

Table 3A-2 summarizes simulated average annual DW project operations under Alternative 3, showing DeltaSOS-adjusted exports; required outflow; DW diversions and discharges for export; and effects on export, outflow, and major Delta channel flows. Average annual reductions in Delta outflow associated with this alternative would be equivalent to the volume of diversions but would not cause violations of applicable outflow standards.

Table 3A-10 indicates that the average annual values for simulated DW operations for Alternative 3 were 356 TAF/yr of diversions and 302 TAF/yr of discharges for export. These values are much greater than for Alternative 1 or Alternative 2 because of the increased reservoir storage capacity on four project islands. Increased storage capacity allows increased DW diversions during years with plentiful surplus water but does not compensate for years of limited water availability. The greatest simulated annual DW diversion for Alternative 3 was 815 TAF/yr in 1982 (two complete DW reservoir fillings). It is unlikely that this volume of additional water supply would be needed in wet years. Table A3-13 in Appendix A3 gives the monthly results of simulations of Alternative 3.

Table 3A-11 shows the monthly percentiles of DW operations for Alternative 3. Diversions generally would occur early in the water year (October-February) and discharges would generally occur during early spring (February-March) or summer (June-August).

Figure 3A-12 shows the simulated annual DW diversions and DW discharges for Alternative 3. The patterns of years with no DW operation, years with large DW diversions and carryover DW storage, and years with reduced DW diversions because of carryover storage are similar to those of the other alternatives.

Appendix A3 presents detailed simulation results for Alternative 3. Appendix A4 discusses the possible differences between these monthly average simulations and likely daily DW operations.

Effects on Delta Consumptive Use

Under Alternative 3, evaporation of stored water from all four DW islands is estimated to average 54 TAF/yr (Table 3A-5). Because all four islands would be operated as reservoir islands, there would be essentially no habitat island ET as under Alternatives 1 and 2 except for ET from a small portion of Bouldin Island. Some ET would occur from intermittent wetlands during nonstorage periods on the four reservoir islands, but the extent of this ET is not predictable.

Total consumptive use under Alternative 3 is predicted to average 54 TAF/yr, approximately 10 TAF/yr greater than under the No-Project Alternative. This increase in Delta consumptive use represents about a 1% increase in Delta lowland consumptive use. The consumptive use under Alternative 3 would be supplied by DW project diversions, whereas the No-Project Alternative consumptive use would be supplied by irrigation diversions in summer.

Summary of Project Impacts and Recommended Mitigation Measures

Impact A-3: Increase in Delta Consumptive Use. Implementation of Alternative 3 would increase consumptive use by approximately 10 TAF compared with consumptive use under the No-Project Alternative. This increase represents about a 1% increase in Delta lowland consumptive use. Therefore, this impact is considered a significant and unavoidable impact of water storage operations. The reduced diversions during the irrigation season may still be considered a benefit to Delta water supply.

Mitigation. No mitigation is available to reduce this impact to a less-than-significant level. Therefore, this impact is considered significant and unavoidable.

IMPACTS AND MITIGATION MEASURES OF THE NO-PROJECT ALTERNATIVE

The No-Project Alternative (intensified agricultural use of the four DW project islands) represents Delta water supply conditions predicted under implementation of the 1995 WQCP.

The DeltaSOS simulation results for the No-Project Alternative were described above under "Impact Assessment Methodology". Table 3A-2 summarizes simulated average annual DW project operations under the No-Project Alternative, showing DeltaSOS-adjusted exports; required outflow; and export, outflow, and major Delta channel flows.

Simulated Delta exports for the No-Project Alternative averaged 6.15 MAF/yr over the 70-year hydrologic record (Appendix A3). Delta exports under actual historical conditions totaled approximately 6 MAF in 1990 (Table 3A-1). The increased Delta consumptive use of 22 TAF can be attributed to variations in Delta agricultural use between drought and normal years.

Consumptive use of water to supply crop ET would be somewhat greater under the No-Project Alternative compared with historical agricultural land uses, but not measurably so at the scale of monthly water supply modeling (e.g., DWRSIM or DeltaSOS). Chapter 2, "Delta Wetlands Project Alternatives", describes the likely ET increase from existing (drought) conditions (i.e., 1988-1994) to intensive agricultural land use (No-Project Alternative) as 50% of the assumed consumptive use of 44 TAF/yr for the DW project islands. The lower estimated ET for the existing condition (22 TAF/yr) was caused by reduced agricultural use during the drought.

CUMULATIVE IMPACTS

Cumulative water supply effects were evaluated using DeltaSOS simulations of the DW project alternatives under the 1995 WQCP, but assuming SWP pumping permitted at full capacity of Banks Pumping Plant. This represents reasonably foreseeable future Delta conditions and regulatory standards (see description under "Impact Assessment Methodology" above). Cumulative water supply effects of the DW project alternatives are compared below with simulated monthly Delta water supply conditions for the No-Project Alternative under cumulative conditions.

The reservoir islands may have somewhat greater water storage capacity under cumulative conditions because of effects of continued peat soil oxidation and subsidence (see Appendix C3, "Water Quality Experiments on Potential Sources of Dissolved Organics and Trihalomethane Precursors for the Delta Wetlands Project"). DW estimates that average subsidence over the 50-year planning life of the project may average 0.5 inch per year over the 10,000 acres of the reservoir islands (Forkel pers. comm.). This average rate of subsidence would increase water storage capacity under cumulative conditions by approximately 20 TAF or 9% of the reservoir storage capacity. Therefore, possible average DW project diversions and discharges may be approximately 9% greater than those simulated by DeltaSOS.

Water Supply Conditions for the No-Project Alternative under Cumulative Conditions

Delta Water Supply Simulations

Appendix A-3 presents complete DeltaSOS simulation results for cumulative Delta water supply conditions, represented as the No-Project Alternative under cumulative conditions. Selected variables are summarized in this chapter.

Figure 3A-13 shows the simulated monthly Delta outflow and the required Delta outflow for the No-Project Alternative under cumulative conditions for water years 1968-1991. The pattern of required Delta outflow is the same as for the No-Project Alternative.

Figure 3A-14 shows the simulated monthly Delta exports for the No-Project Alternative under cumulative conditions for water years 1968-1991. The DWRSIM simulation of exports used as the initial Delta water budget did not assume use of the full SWP pumping capacity of 10,300 cfs. The DeltaSOS simulation of the No-Project Alternative under cumulative conditions indicates that a considerable amount of additional export pumping would be possible beyond that simulated by DWRSIM. However, DeltaSOS does not check for south-of-Delta demands on storage capacity and DeltaSOS does not change the DWRSIM estimates of carriage water (see Appendix A2). The DeltaSOS adjustment in exports for the cumulative No-Project Alternative averaged 1,018 TAF/yr (Table 3A-2).

Figure 3A-15 shows the simulated monthly pattern of water available for DW diversion for the cumulative No-Project Alternative for water years 1968-1991. Tables 3A-12 and 3A-13 show the mean annual simulation output and monthly percentiles of simulations for exports under the No-Project Alternative.

Figure 3A-16 shows annual Delta outflow and required Delta outflow for the No-Project Alternative under cumulative conditions for water years 1922-1991. Table A3-14 in Appendix A3 shows the annual DeltaSOS adjustments in initial Delta exports (DWRSIM results) and the DeltaSOS-adjusted Delta exports (that satisfy standards while exporting all available water) for the No-Project Alternative under cumulative conditions. Monthly DeltaSOS adjustment to DWRSIM-simulated exports are shown in Table A3-16 in Appendix A3. In some years, no additional export pumping was simulated by DeltaSOS, whereas in other years more than 3 MAF of additional export was simulated beyond the DWRSIM results (1983 and 1984). The total adjusted export for 13 out of 70 years was greater than 8 MAF/yr (i.e., in wet years) because of the greater assumed Delta permitted pumping rate. Some of these potential exports may not be required for south-of-Delta beneficial uses.

Each of the DW alternatives was simulated under cumulative conditions and compared with the DeltaSOS simulation results for the No-Project Alternative under cumulative conditions to determine cumulative water supply effects.

Delta Consumptive Use

Net consumptive use on the DW project islands under the No-Project Alternative is estimated to be 44 TAF/yr under cumulative conditions.

Cumulative Impacts, Including Impacts of Alternative 1

Delta Water Supply Simulations

Table 3A-2 summarizes simulated average annual DW project operations for Alternative 1 under cumulative conditions, showing DeltaSOS-adjusted exports; required outflow; DW diversions and discharges for export; and effects on export, outflow, and major Delta channel flows. Average annual reductions in Delta outflow associated with this alternative would be equivalent to the volume of diversions (minus No-Project Alternative consumptive use) but would not cause violations of applicable outflow standards.

Table 3A-14 presents annual average Delta conditions simulated by DeltaSOS for Alternative 1 under cumulative conditions. Simulated DW operations for Alternative 1 consist of average diversions of 191 TAF/yr and average discharges for export of 166 TAF/yr. Alternative 1 would have operated in fewer years under cumulative conditions than under existing conditions because of limited availability of water for diversions. Because of the greater export pumping capacity, however, greater DW exports were simulated in several of the years. Table 3A-15 gives the monthly percentiles of the DeltaSOS estimates for Alternative 1 under cumulative conditions. Table A3-19 in Appendix A3 gives the monthly results and cumulative conditions.

Figure 3A-17 shows simulated annual DW diversions and DW discharges for export for Alternative 1 under cumulative conditions for water years 1922-1991. Average DW discharges for export were simulated to be approximately 12% less under cumulative conditions than under Alternative 1 (Table 3A-2).

Alternative 1, if permitted by SWRCB, would comply with all applicable Delta standards and operating criteria under cumulative conditions.

Effects on Delta Consumptive Use

Because of differences in periods of DW diversions and discharges, consumptive use from evaporation under Alternative 1 would be reduced by 9 TAF/yr (from 48 TAF/yr to 39 TAF/yr) under cumulative future conditions (Table 3A-5). The consumptive use of 39 TAF/yr represents a decrease of 5 TAF/yr from consumptive use under the No-Project Alternative.

Impact A-4: Reduction in Delta Consumptive Use under Cumulative Conditions. Under cumulative conditions, implementation of Alternative 1 would decrease Delta consumptive use by 5 TAF/yr from consumptive use estimated for the No-Project Alternative. This impact is considered beneficial.

Mitigation. No mitigation is required.

Cumulative Impacts, Including Impacts of Alternative 2

Delta Water Supply Simulations

Table 3A-2 summarizes simulated average annual DW project operations for Alternative 2 under cumulative conditions, showing DeltaSOS-adjusted exports; required outflow; DW diversions and discharges for export; and effects on export, outflow, and major Delta channel flows. Average annual reductions in Delta outflow associated with this alternative would be equivalent to the volume of diversions (minus No-Project Alternative consumptive use) but would not cause violations of applicable outflow standards.

Table 3A-16 indicates that the average annual simulated DW operations for Alternative 2 under cumulative conditions were 211 TAF/yr of diversions and 197 TAF/yr of discharges for export.

Table 3A-17 shows the monthly percentiles of DW operations and Table A3-22 in Appendix A3 gives the monthly results for Alternative 2 under cumulative conditions.

Figure 3A-18 shows simulated annual DW diversions and DW discharges for Alternative 2 under cumulative conditions for water years 1922-1991. Average DW discharges for export were simulated to be approximately 3% less under cumulative conditions than under Alternative 2 (Table 3A-2).

Alternative 2, if permitted by SWRCB, would comply with all applicable Delta standards and operating criteria under cumulative conditions.

Effects on Delta Consumptive Use

Consumptive use from evaporation under Alternative 2 would be reduced by 9 TAF/yr (from 37 TAF/yr to 28 TAF/yr) under cumulative future conditions (Table 3A-5). The consumptive use of 28 TAF/yr represents a decrease of 16 TAF/yr from consumptive use under the No-Project Alternative.

Under cumulative conditions, Alternative 2 would have the same impact on consumptive use as described above for Alternative 1 under cumulative conditions.

Cumulative Impacts, Including Impacts of Alternative 3

Delta Water Supply Simulations

Table 3A-2 summarizes simulated average annual DW project operations for Alternative 3 under cumulative conditions, showing DeltaSOS-adjusted exports; required outflow; DW diversions and discharges for export; and effects on export, outflow, and major Delta channel flows. Average annual reductions in Delta outflow associated with this alternative would be equivalent to the volume of diversions (minus No-Project Alternative consumptive use) but would not cause violations of applicable outflow standards.

Table 3A-18 indicates that the average annual simulated DW operations for Alternative 3 under cumulative conditions were 314 TAF/yr of diversions and 282 TAF/yr of discharges for export.

Table 3A-19 shows the monthly percentiles of DW operations for Alternative 3 under cumulative conditions and Table A3-25 in Appendix A3 gives the monthly results.

Figure 3A-19 shows simulated annual DW diversions and DW discharges for Alternative 3 under cumulative conditions for water years 1922-1991. DW discharges for export were 7% less under cumulative conditions (Table 3A-2). No significant cumulative water supply impacts are identified.

Alternative 3, if permitted by SWRCB, would comply with all applicable Delta standards and operating criteria under cumulative conditions.

Effects on Delta Consumptive Use

Consumptive use under Alternative 3 would be reduced by 22 TAF/yr (from 54 TAF/yr to 32 TAF/yr) under cumulative conditions (Table 3A-5). The consumptive use of 32 TAF/yr represents a decrease of 12 TAF/yr from consumptive use under the No-Project Alternative.

Under cumulative conditions, Alternative 3 would have the same impact on consumptive use as described above for Alternative 1 under cumulative conditions.

Cumulative Impacts, Including Impacts of the No-Project Alternative

The No-Project Alternative would not contribute measurably to cumulative effects on consumptive use in the Delta.

CITATIONS

Printed References

California. Department of Water Resources. 1986. DAYFLOW program documentation and data summary user's guide. February. Central District. Sacramento, CA.

________. Department of Water Resources. 1990a. North Delta program draft environmental impact report/environmental impact statement. November. Sacramento, CA.

________. Department of Water Resources. 1990b. South Delta water management program - phase I of water banking program draft environmental impact report/environmental impact statement. June. Sacramento, CA.

________. Department of Water Resources. 1990c. Los Banos Grandes facilities draft environmental impact report. December. Sacramento, CA.

________. Department of Water Resources. 1994. California water plan update. (Bulletin 160-93.) Sacramento, CA.

________. State Water Resources Control Board. 1989. Information pertaining to water rights in California. Sacramento, CA.

________. State Water Resources Control Board. 1995. Environmental report appendix to the water quality control plan for the San Francisco Bay/Sacramento-San Joaquin Delta estuary. Sacramento, CA.

Contra Costa Water District and U.S. Department of the Interior, Bureau of Reclamation, Mid-Pacific Region. 1993. Stage 2 environmental impact report/environmental impact statement for the Los Vaqueros Project, Contract Costa County, California. Final. September 8, 1993. Concord and Sacramento, CA. Technical assistance provided by Jones & Stokes Associates, Inc. (JSA 90-211); Montgomery Watson Americas; Woodward-Clyde Consultants; and Sonoma State University, Sacramento, CA.

National Marine Fisheries Service. 1993. Biological opinion for the operation of the federal Central Valley Project and the California State Water Project. Long Beach, CA.

San Francisco Estuary Project. 1993. Managing freshwater discharge to the San Francisco Bay/Sacramento-San Joaquin Delta estuary: the scientific basis for an estuarine standard. Oakland, CA.

U.S. Fish and Wildlife Service. 1995. Formal consultation and conference on effects of long-term operation of the Central Valley Project and State Water Project on the threatened delta smelt, delta smelt critical habitat, and proposed threatened Sacramento splittail. (1-1-94-F-70.) March 6, 1995. Sacramento, CA.

Personal Communications

Forkel, David. Project manager. Delta Wetlands, Lafayette, CA. February 17, 1994 - telephone conversation.

Table 3A-1. Annual Historical Delta Water Budget for 1922 – 1991

Water Year	Sac Basin Year Type [a]	SJR Basin Year Type [a]	Sac Inflow (TAF)	Yolo Bypass Flow (TAF)	Eastside Inflow (TAF)	SJR Basin Inflow (TAF)	Total Delta Inflow (TAF)	Delta Rain (TAF)	Delta Consumptive Use (TAF)	Delta Channel Depletion (TAF)	Delta Exports (TAF)	Delta Outflow (TAF)
1922	2	1	18,998	1,302	1,840	6,732	28,873	548	1,425	877	0	28,798
1923	3	2	13,989	0	1,440	4,043	19,471	562	1,425	863	0	19,471
1924	5	5	4,373	0	106	486	4,965	146	1,425	1,279	0	4,965
1925	4	3	15,363	2,485	1,474	3,749	23,071	626	1,425	799	0	23,071
1926	4	4	11,747	721	461	1,939	14,868	446	1,425	979	0	14,868
1927	1	2	23,001	5,200	1,641	5,076	34,918	599	1,425	826	0	34,918
1928	2	3	16,199	2,092	1,034	2,709	22,033	432	1,425	993	0	22,033
1929	5	5	7,472	0	266	937	8,675	288	1,425	1,137	0	8,675
1930	4	5	13,190	906	466	1,266	15,828	607	1,411	804	0	15,017
1931	5	5	5,148	36	159	678	6,021	523	1,405	881	0	5,132
1932	4	2	12,218	432	930	3,669	17,249	731	1,400	669	0	16,577
1933	5	4	7,722	64	418	1,383	9,587	531	1,399	868	0	8,706
1934	5	5	8,041	228	432	928	9,629	558	1,399	842	0	8,786
1935	3	2	16,043	2,072	1,043	4,034	23,192	765	1,398	633	0	22,551
1936	3	2	15,512	3,357	1,602	4,986	25,458	984	1,401	416	0	25,057
1937	3	1	13,670	1,228	1,231	5,510	21,640	958	1,400	443	0	21,206
1938	1	1	25,878	14,152	2,188	10,879	53,096	1,002	1,401	399	0	52,716
1939	4	4	7,080	170	422	1,714	9,386	581	1,413	831	0	8,551
1940	2	2	18,267	6,974	1,340	4,765	31,346	948	1,429	481	0	30,867
1941	1	1	23,698	11,510	1,292	7,310	43,810	1,026	1,442	417	0	43,400
1942	1	1	22,795	6,733	1,565	6,188	37,281	1,121	1,456	335	0	36,944
1943	1	1	19,660	3,145	1,826	6,079	30,710	1,044	1,472	428	0	30,287
1944	4	3	9,069	124	515	1,798	11,506	751	1,487	737	0	10,772
1945	3	2	13,155	735	1,185	4,446	19,521	837	1,523	686	0	18,843
1946	3	2	15,903	2,101	1,091	3,627	22,723	748	1,553	805	0	21,908
1947	4	4	9,491	72	369	1,334	11,266	510	1,580	1,071	0	10,189
1948	3	3	14,552	301	703	1,550	17,106	660	1,610	951	0	16,145
1949	4	3	11,793	260	613	1,242	13,909	636	1,626	991	0	12,597
1950	3	3	13,948	357	993	1,796	17,093	606	1,642	1,036	21	15,236
1951	2	2	21,766	3,445	2,321	4,735	32,268	927	1,644	718	192	30,552
1952	1	1	28,056	3,945	2,477	7,136	41,615	1,096	1,646	550	195	40,375
1953	1	3	18,121	2,752	859	1,893	23,626	660	1,623	963	821	22,362
1954	2	3	17,110	1,213	717	1,713	20,754	589	1,637	1,049	1,063	19,140
1955	4	4	10,591	76	557	978	12,203	788	1,637	848	1,175	10,040
1956	1	1	22,328	9,860	2,359	6,287	40,833	1,159	1,686	527	765	39,743
1957	2	3	13,150	778	684	1,440	16,052	759	1,684	925	1,233	13,920
1958	1	1	26,058	10,012	2,396	6,059	44,525	1,573	1,684	111	705	43,765
1959	3	4	12,059	635	366	1,249	14,308	794	1,684	890	1,404	12,039
1960	4	5	10,771	618	255	550	12,194	559	1,686	1,127	1,460	9,707
1961	4	5	11,488	169	103	438	12,198	713	1,684	971	1,561	9,687
1962	3	3	13,089	1,123	683	1,505	16,400	820	1,684	864	1,422	14,139
1963	1	2	20,422	4,170	1,334	2,839	28,766	1,247	1,684	437	1,400	26,969
1964	4	4	11,591	67	307	1,119	13,083	643	1,686	1,044	1,726	10,384
1965	1	1	14,965	6,193	1,644	3,803	31,604	926	1,684	759	1,539	29,347
1966	3	3	13,392	377	639	1,698	16,106	686	1,684	999	1,678	13,449
1967	1	1	24,233	3,661	1,723	5,559	35,177	1,294	1,684	390	1,323	33,515
1968	3	4	13,377	668	520	1,423	15,987	653	1,686	1,033	2,564	12,507
1969	1	1	23,362	6,281	2,391	10,168	42,202	1,260	1,684	424	2,953	38,883
1970	1	2	20,289	8,500	1,415	3,076	33,280	895	1,684	789	2,162	30,290
1971	1	3	22,811	1,306	902	1,779	26,797	941	1,684	743	2,905	23,191
1972	3	4	12,470	30	365	1,112	13,977	437	1,686	1,249	3,544	9,261
1973	2	2	20,758	3,887	1,429	2,392	28,466	1,244	1,684	440	3,457	24,609
1974	1	1	30,663	7,566	1,551	2,773	42,553	995	1,684	689	4,439	37,482
1975	1	1	19,941	951	1,125	2,826	24,842	828	1,684	856	3,983	20,043
1976	5	5	10,963	15	206	1,523	12,707	460	1,686	1,226	4,951	6,583
1977	5	5	5,497	1	30	416	5,944	445	1,684	1,239	2,177	2,539
1978	2	1	17,691	2,844	1,146	4,490	26,172	1,368	1,684	316	4,427	21,467
1979	3	2	13,034	154	1,020	2,625	16,832	941	1,684	743	4,561	11,555
1980	2	1	19,248	6,502	1,830	5,986	33,566	1,045	1,686	641	4,610	28,501
1981	4	4	11,499	126	286	1,763	13,675	725	1,684	960	4,829	7,908
1982	1	1	30,101	7,229	3,038	5,477	45,845	1,655	1,684	30	4,696	41,230
1983	1	1	34,049	14,962	4,557	15,438	69,006	1,713	1,684	(29)	4,479	64,643
1984	1	2	22,384	4,689	1,807	6,260	35,140	863	1,686	824	3,938	30,592
1985	4	4	12,192	172	470	2,101	14,935	743	1,684	941	5,584	8,453
1986	1	1	18,112	10,608	2,124	5,235	36,080	1,454	1,684	230	5,396	30,493
1987	4	5	10,031	35	384	1,808	12,257	683	1,684	1,001	5,174	6,105
1988	5	5	9,653	115	143	1,164	11,075	718	1,686	968	5,746	4,409
1989	4	5	12,244	44	221	1,057	13,566	795	1,684	889	6,101	6,599
1990	5	5	9,860	21	169	914	10,965	619	1,680	1,060	5,947	3,967
1991	5	5	7,540	75	221	655	8,491	847	1,681	834	3,286	4,371
Average			15,856	2,752	1,077	3,319	23,004	819	1,587	768	1,737	20,616

Notes: [a] 1 = wet, 2 = above normal, 3 = below normal, 4 = dry, 5 = critically dry.
Sources: The 1922–1929 data are from the UNIMPAIRED data set and the 1930–1991 data are from the DAYFLOW database, both maintained by DWR. See Appendix A1 for details.

Table 3A–2. Summary of 70–Year DeltaSOS Mean Annual Simulation Output for Channel Flows, Diversions, and Exports under the DW Project Alternatives and the No–Project Alternative (TAF)

Location	No–Project Alternative	Alternative 1	Alternative 2	Alternative 3	No–Project Alternative Cumulative	Alternative 1 Cumulative	Alternative 2 Cumulative	Alternative 3 Cumulative
Sutter & Steamboat Slough flow	5,091	5,091	5,091	5,091	5,091	5,091	5,091	5,091
Revised DCC diversion	1,347	1,347	1,347	1,347	1,347	1,347	1,347	1,347
Georgiana Slough flow	4,090	4,090	4,090	4,090	4,090	4,090	4,090	4,090
Rio Vista flow	13,793	13,793	13,793	13,793	13,793	13,793	13,793	13,793
Initial DWRSIM exports	5,712	5,712	5,712	5,712	5,712	5,712	5,712	5,712
Net export change	442	450	450	464	1,018	1,029	1,029	1,046
Adjusted total export	6,154	6,162	6,162	6,177	6,730	6,741	6,741	6,759
Required Delta outflow	5,802	5,802	5,802	5,802	5,802	5,802	5,802	5,802
Outflow deficit	0	0	0	0	0	0	0	0
Montezuma Slough flow	930	931	931	931	930	931	931	931
Head of Old River diversion	1,370	1,369	1,369	1,369	1,369	1,369	1,369	1,369
Available for DW diversion	2,572	2,575	2,575	2,579	1,995	1,996	1,996	1,996
DW storage diversions	0	222	225	356	0	191	211	314
DW storage exports	0	188	202	302	0	166	197	282
DW storage releases	0	0	0	0	0	0	0	0
Final total export	6,154	6,350	6,364	6,479	6,730	6,907	6,938	7,041
Final QWEST flow	420	215	212	92	(156)	(333)	(353)	(448)
Final Delta outflow	14,120	13,915	13,912	13,792	13,544	13,367	13,347	13,252
Final Antioch flow	3,504	3,363	3,361	3,363	3,108	2,987	2,973	2,908
Old & Middle River flow	(5,304)	(5,499)	(5,514)	(5,499)	(5,879)	(6,056)	(6,087)	(6,191)

Note: Negative values shown in parentheses.

Table 3A–3. DeltaSOS Mean Annual Simulation Output for the No–Project Alternative

Water Year	SJR Basin Year Type	Available for DW Diversion (TAF)	Delta Storage (TAF)	Delta Storage Diversion (TAF)	Delta Storage Export (TAF)	Delta Storage Outflow (TAF)	Final Total Export (TAF)	Final QWEST Flow (TAF)	Final Delta Outflow (TAF)	3–Mile Slough Flow (TAF)	Old River Diversion Flow (TAF)	Final Antioch Flow (TAF)
1922	1	1,073	0	0	0	0	6,380	604	12,101	2,512	1,587	3,115
1923	2	2,231	0	0	0	0	6,491	140	10,478	2,386	1,369	2,526
1924	5	2	0	0	0	0	4,539	(1,152)	4,158	1,628	825	476
1925	3	770	0	0	0	0	5,796	(753)	8,206	2,343	852	1,590
1926	4	427	0	0	0	0	5,757	(1,085)	6,974	2,242	877	1,157
1927	2	2,854	0	0	0	0	6,604	(175)	17,268	4,140	1,038	3,966
1928	3	2,464	0	0	0	0	6,734	(706)	13,846	3,637	996	2,931
1929	5	0	0	0	0	0	4,564	(911)	4,548	1,585	851	673
1930	5	281	0	0	0	0	5,000	(1,037)	6,229	2,043	764	1,005
1931	5	0	0	0	0	0	3,327	(312)	3,677	1,054	831	743
1932	2	148	0	0	0	0	4,272	158	5,700	1,263	943	1,421
1933	4	0	0	0	0	0	3,678	(351)	4,288	1,218	853	867
1934	5	121	0	0	0	0	3,734	(445)	4,831	1,395	805	950
1935	2	612	0	0	0	0	5,986	(457)	9,392	2,459	1,131	2,002
1936	2	1,424	0	0	0	0	6,202	62	10,803	2,503	1,192	2,565
1937	1	934	0	0	0	0	5,890	768	9,629	1,842	1,494	2,610
1938	1	8,833	0	0	0	0	7,215	4,892	35,927	5,715	3,087	10,607
1939	4	548	0	0	0	0	5,781	(1,228)	5,635	2,013	995	785
1940	2	2,650	0	0	0	0	6,456	39	17,614	4,100	1,046	4,139
1941	1	5,967	0	0	0	0	6,660	2,540	30,118	5,644	2,157	8,185
1942	1	5,141	0	0	0	0	7,230	1,487	26,463	5,374	1,534	6,861
1943	1	4,699	0	0	0	0	6,712	2,090	19,572	3,441	1,611	5,531
1944	3	45	0	0	0	0	5,986	(1,246)	6,439	2,207	984	960
1945	2	880	0	0	0	0	6,487	(622)	8,286	2,294	1,254	1,672
1946	2	2,348	0	0	0	0	6,340	(139)	12,946	3,119	1,135	2,980
1947	4	1	0	0	0	0	6,032	(1,609)	5,559	2,202	958	594
1948	3	19	0	0	0	0	6,364	(1,517)	7,322	2,561	806	1,044
1949	3	449	0	0	0	0	5,709	(1,081)	7,100	2,272	842	1,191
1950	3	319	0	0	0	0	6,177	(1,212)	7,528	2,443	866	1,231
1951	2	5,184	0	0	0	0	7,131	1,567	19,847	3,789	1,430	5,356
1952	1	6,017	0	0	0	0	7,533	2,332	27,154	5,071	1,548	7,403
1953	3	2,568	0	0	0	0	6,801	(755)	15,854	4,132	1,084	3,377
1954	3	2,571	0	0	0	0	7,024	(1,203)	14,233	4,002	908	2,799
1955	4	701	0	0	0	0	6,077	(1,502)	6,170	2,283	844	781
1956	1	5,266	0	0	0	0	7,129	2,044	26,827	5,153	1,711	7,197
1957	3	931	0	0	0	0	6,761	(1,240)	9,695	2,963	964	1,723
1958	1	6,692	0	0	0	0	7,634	2,410	31,978	6,148	2,019	8,557
1959	4	1,805	0	0	0	0	6,103	(839)	9,803	2,770	997	1,931
1960	5	156	0	0	0	0	5,844	(1,661)	6,050	2,345	802	684
1961	5	222	0	0	0	0	5,768	(1,731)	6,003	2,371	763	640
1962	3	822	0	0	0	0	5,788	(967)	8,118	2,444	892	1,476
1963	2	3,051	0	0	0	0	7,129	(520)	18,205	4,546	1,021	4,025
1964	4	1,256	0	0	0	0	5,967	(1,447)	6,931	2,434	869	987
1965	1	3,152	0	0	0	0	6,732	652	19,806	4,282	1,246	4,935
1966	3	1,213	0	0	0	0	6,798	(1,380)	8,544	2,771	1,110	1,392
1967	1	4,457	0	0	0	0	7,625	1,162	21,014	4,278	1,729	5,440
1968	4	2,129	0	0	0	0	6,544	(1,080)	10,992	3,178	943	2,098
1969	1	6,435	0	0	0	0	7,306	4,789	28,667	4,081	3,097	8,870
1970	2	5,612	0	0	0	0	6,777	1,982	26,265	5,060	1,632	7,042
1971	3	2,998	0	0	0	0	6,965	(362)	16,462	4,058	993	3,696
1972	4	601	0	0	0	0	6,666	(1,896)	7,234	2,751	902	855
1973	2	4,137	0	0	0	0	6,919	660	19,041	4,090	1,204	4,750
1974	1	6,240	0	0	0	0	7,436	1,506	31,451	6,528	1,154	8,034
1975	1	2,723	0	0	0	0	7,596	(208)	15,848	3,831	1,176	3,623
1976	5	567	0	0	0	0	5,079	(1,367)	5,423	2,041	755	674
1977	5	0	0	0	0	0	3,053	(453)	3,657	1,129	676	676
1978	1	2,712	0	0	0	0	5,719	934	15,992	3,230	1,158	4,165
1979	2	1,050	0	0	0	0	6,485	(350)	9,570	2,443	1,220	2,093
1980	1	5,330	0	0	0	0	6,404	3,484	22,768	3,420	2,567	6,904
1981	4	777	0	0	0	0	6,477	(1,351)	7,698	2,559	1,068	1,208
1982	1	8,661	0	0	0	0	7,773	6,421	36,441	4,996	3,355	11,417
1983	1	21,445	0	0	0	0	8,377	18,602	61,152	4,091	9,324	22,693
1984	2	8,816	0	0	0	0	7,109	5,669	27,727	3,388	3,669	9,058
1985	4	1,574	0	0	0	0	6,239	(921)	8,171	2,431	1,103	1,511
1986	1	6,120	0	0	0	0	6,486	4,748	27,860	3,913	2,756	8,660
1987	5	67	0	0	0	0	5,844	(1,331)	5,852	2,119	919	788
1988	5	418	0	0	0	0	4,440	(980)	5,148	1,761	685	781
1989	5	228	0	0	0	0	5,296	(1,352)	6,626	2,310	646	957
1990	5	60	0	0	0	0	4,063	(835)	4,617	1,558	633	723
1991	5	4	0	0	0	0	3,804	(585)	4,857	1,478	634	892
Average		2,572	0	0	0	0	6,154	420	14,120	3,084	1,370	3,504

Notes: Definitions of the categories are provided in Table A2–3 in Appendix A2.
Water–year types: 1=wet, 2=above normal, 3=below normal, 4=dry, 5=critically dry.
Negative values shown in parentheses.

Table 3A–4. Monthly Percentiles for DeltaSOS Simulations for the No–Project Alternative under Cumulative Conditions

DW diversion (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

DW storage (TAF)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

DW discharge for export (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

DW discharge for outflow (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

Final CVP Tracy and SWP Banks exports (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	4,288	3,326	5,072	4,844	4,073	3,147	2,791	2,395	1,076	1,818	537	3,271
10	5,125	5,385	7,368	8,686	6,384	4,525	3,571	3,114	5,464	3,427	3,448	3,592
20	6,854	6,640	7,842	10,935	7,285	6,095	3,789	3,538	5,568	6,446	4,730	5,890
30	7,992	7,372	9,922	11,372	9,184	7,956	4,189	3,928	5,766	7,379	5,083	6,051
40	8,500	8,383	10,868	11,428	11,137	10,191	5,623	4,859	5,923	8,865	5,864	6,359
50	9,055	10,670	11,176	11,562	11,633	11,268	6,573	5,685	6,313	10,505	6,324	6,518
60	9,710	11,280	11,246	11,732	12,009	11,323	7,380	6,754	6,543	11,280	7,174	6,685
70	11,280	11,280	11,298	11,849	12,462	11,461	8,476	7,487	7,026	11,280	7,966	7,409
80	11,280	11,280	11,393	12,266	12,700	11,499	9,203	8,673	8,448	11,280	9,615	10,062
90	11,280	11,280	11,503	12,700	12,700	11,700	9,950	9,950	11,280	11,280	11,280	11,280
100	11,280	11,280	11,700	12,700	12,700	11,700	11,280	11,280	11,280	11,280	11,280	11,280
Mean	8,965	9,107	10,138	11,205	10,487	9,420	6,697	6,209	6,974	8,952	6,847	7,147

Table 3A-5. Consumptive Water Use Estimated for the DW Project Alternatives

Alternative	Consumptive Water Use (TAF/yr)			Change in Consumptive Use in Relation to the No-Project Alternative
	Habitat Island ET[a]	Stored Water Evaporation	Total	
No-Project Alternative (17,500 irrigated acres)	44[b]	0	44	Not applicable
Alternative 1 (two reservoir and two habitat islands)	14	34	48	+4
Alternative 2 (two reservoir and two habitat islands)	14	23	37	-7
Alternative 3 (four reservoir islands)	0	54	54	+10
No-Project Alternative Cumulative	44[b]	0	44	Not applicable
Alternative 1 Cumulative	14	25	39	-5
Alternative 2 Cumulative	14	14	28	-16
Alternative 3 Cumulative	0	32	32	-12

[a] ET on habitat islands consists of ET from crops grown for habitat purposes plus ET from flooded wetlands.

[b] Represents total ET on all four DW project islands under intensified agriculture; wildlife habitat is not specifically developed or managed under the No-Project Alternative.

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Table 3A–6. DeltaSOS Mean Annual Simulation Output for Alternative 1

Water Year	Sac Basin Year Type	Available for DW Diversion (TAF)	Delta Storage (TAF)	Delta Storage Diversion (TAF)	Delta Storage Export (TAF)	Delta Storage Outflow (TAF)	Final Total Export (TAF)	Final QWEST Flow (TAF)	Final Delta Outflow (TAF)	3–Mile Slough Flow (TAF)	Old River Diversion Flow (TAF)	Final Antioch Flow (TAF)	Old & Middle Flow (TAF)
1922	2	1,073	238	257	225	0	6,614	363	11,860	2,587	1,587	2,950	(5,526)
1923	3	2,239	238	246	241	0	6,726	(75)	10,263	2,454	1,369	2,379	(5,852)
1924	5	3	3	3	0	0	4,558	(1,149)	4,161	1,627	825	478	(4,391)
1925	4	774	222	246	183	0	5,987	(982)	7,977	2,415	852	1,433	(5,612)
1926	4	432	238	260	203	0	5,950	(1,309)	6,750	2,312	877	1,003	(5,610)
1927	1	2,854	238	277	239	0	6,857	(441)	17,003	4,224	1,038	3,783	(6,297)
1928	2	2,473	238	252	207	0	6,953	(946)	13,606	3,712	996	2,766	(6,504)
1929	5	0	0	0	0	0	4,583	(906)	4,553	1,583	851	677	(4,338)
1930	4	281	238	238	203	0	5,218	(1,264)	6,002	2,114	764	850	(5,013)
1931	5	0	0	0	0	0	3,341	(301)	3,688	1,051	831	750	(3,120)
1932	4	148	150	148	142	0	4,439	11	5,553	1,309	943	1,320	(4,009)
1933	5	0	0	0	0	0	3,696	(344)	4,295	1,216	853	872	(3,461)
1934	5	121	123	121	92	0	3,849	(564)	4,712	1,432	805	868	(3,644)
1935	3	617	238	248	206	0	6,198	(686)	9,163	2,531	1,100	1,845	(5,596)
1936	3	1,433	238	243	208	0	6,392	(138)	10,603	2,566	1,192	2,428	(5,663)
1937	3	934	238	259	214	0	6,115	522	9,383	1,920	1,494	2,442	(5,066)
1938	1	8,837	238	431	225	0	7,448	4,478	35,514	5,845	3,087	10,323	(4,735)
1939	4	552	238	84	202	0	5,995	(1,299)	5,564	2,035	995	736	(5,626)
1940	2	2,660	238	248	209	0	6,676	(195)	17,381	4,173	1,046	3,978	(6,032)
1941	1	5,968	238	249	219	0	6,887	2,307	29,885	5,717	2,157	8,025	(5,077)
1942	1	5,142	238	252	219	0	7,459	1,251	26,227	5,448	1,534	6,698	(6,371)
1943	1	4,700	238	246	214	0	6,944	1,851	19,334	3,516	1,611	5,367	(5,831)
1944	4	50	43	50	36	0	6,031	(1,281)	6,405	2,217	984	936	(5,609)
1945	3	880	238	253	201	0	6,667	(829)	8,079	2,359	1,254	1,530	(5,947)
1946	3	2,353	238	247	242	0	6,558	(338)	12,747	3,181	1,139	2,843	(5,993)
1947	4	9	5	9	0	0	6,039	(1,599)	5,568	2,199	958	600	(5,693)
1948	3	27	18	27	0	0	6,364	(1,519)	7,320	2,562	806	1,043	(6,138)
1949	4	449	238	233	201	0	5,922	(1,301)	6,880	2,341	842	1,040	(5,669)
1950	3	327	238	248	208	0	6,388	(1,438)	7,302	2,514	866	1,076	(6,111)
1951	2	5,187	238	253	204	0	7,333	1,341	19,621	3,860	1,430	5,201	(6,376)
1952	1	6,016	238	506	224	0	7,765	1,842	26,665	5,224	1,548	7,067	(6,626)
1953	1	2,567	238	6	206	0	7,018	(747)	15,861	4,130	1,084	3,382	(6,489)
1954	2	2,577	238	315	271	0	7,307	(1,504)	13,931	4,097	908	2,592	(7,006)
1955	4	709	238	249	213	0	6,292	(1,729)	5,943	2,354	844	625	(6,003)
1956	1	5,267	238	262	212	0	7,339	1,809	26,592	5,226	1,711	7,035	(6,049)
1957	2	940	238	488	444	0	7,213	(1,711)	9,224	3,111	964	1,400	(6,828)
1958	1	6,698	238	493	225	0	7,868	1,933	31,501	6,297	2,019	8,230	(6,167)
1959	3	1,811	238	219	425	0	6,543	(1,048)	9,595	2,835	997	1,787	(6,138)
1960	4	159	145	159	116	0	5,971	(1,807)	5,903	2,390	802	583	(5,769)
1961	4	227	205	227	173	0	5,950	(1,942)	5,791	2,437	763	495	(5,773)
1962	3	827	222	246	190	0	5,989	(1,199)	7,886	2,516	892	1,318	(5,631)
1963	1	3,055	238	264	224	0	7,363	(770)	17,955	4,624	1,021	3,854	(6,786)
1964	4	1,263	238	337	294	0	6,270	(1,768)	6,610	2,534	869	766	(6,015)
1965	1	3,157	238	253	216	0	6,964	408	19,562	4,359	1,246	4,767	(6,237)
1966	3	1,218	238	248	199	0	7,006	(1,612)	8,312	2,844	1,110	1,232	(6,478)
1967	1	4,461	238	498	226	0	7,853	687	20,539	4,427	1,729	5,113	(6,515)
1968	3	2,134	238	23	208	0	6,763	(1,090)	10,982	3,181	943	2,091	(6,401)
1969	1	6,436	238	497	225	0	7,538	4,309	28,188	4,231	3,097	8,541	(4,853)
1970	1	5,616	238	16	207	0	6,995	1,978	26,262	5,062	1,632	7,040	(5,866)
1971	1	3,002	238	456	431	0	7,405	(802)	16,022	4,196	993	3,393	(6,939)
1972	3	609	238	273	235	0	6,908	(2,152)	6,978	2,832	902	679	(6,642)
1973	2	4,138	238	263	218	0	7,150	408	18,790	4,169	1,204	4,577	(6,293)
1974	1	6,244	238	433	206	0	7,649	1,091	31,036	6,658	1,154	7,749	(6,978)
1975	1	2,724	238	124	212	0	7,816	(316)	15,740	3,864	1,176	3,549	(7,174)
1976	5	567	238	195	232	0	5,326	(1,554)	5,237	2,099	755	546	(5,230)
1977	5	0	0	0	0	0	3,076	(452)	3,658	1,128	676	676	(3,050)
1978	2	2,713	238	243	213	0	5,941	708	15,765	3,301	1,158	4,009	(5,160)
1979	3	1,050	238	432	393	0	6,891	(770)	9,150	2,575	1,220	1,805	(6,180)
1980	2	5,331	238	246	210	0	6,594	3,282	22,566	3,483	2,567	6,766	(4,459)
1981	4	782	238	256	217	0	6,706	(1,592)	7,456	2,635	1,068	1,042	(6,237)
1982	1	8,660	238	522	235	0	8,016	5,916	35,935	5,154	3,355	11,070	(4,988)
1983	1	21,447	238	49	0	0	8,377	18,578	61,128	4,099	9,324	22,677	760
1984	1	8,815	238	11	201	0	7,280	5,714	27,771	3,374	3,669	9,088	(4,156)
1985	4	1,578	238	242	199	0	6,450	(1,150)	7,942	2,503	1,103	1,353	(5,888)
1986	1	6,120	238	250	213	0	6,707	4,514	27,626	3,986	2,756	8,500	(4,314)
1987	4	72	68	72	58	0	5,912	(1,389)	5,794	2,137	919	748	(5,606)
1988	5	417	237	234	205	0	4,660	(1,205)	4,923	1,831	685	626	(4,551)
1989	4	236	232	236	204	0	5,504	(1,567)	6,411	2,377	646	810	(5,451)
1990	5	60	61	60	46	0	4,123	(884)	4,568	1,573	633	690	(4,081)
1991	5	4	4	4	0	0	3,824	(585)	4,858	1,477	634	893	(3,788)
Average		2,575	198	222	188	0	6,350	215	13,915	3,148	1,370	3,363	(5,499)

Notes: Definitions of the categories are provided in Table A2–3 in Appendix 2.
Water–year types: 1=wet, 2=above normal, 3=below normal, 4=dry, 5=critically dry.
Negative values shown in parentheses.

Table 3A-7. Monthly Percentiles for DeltaSOS Simulations for Alternative 1

DW diversion (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	15	0	0	0	0	0	0	0	0
50	0	0	13	15	30	49	0	0	0	0	0	0
60	0	25	13	15	31	49	0	0	0	85	0	0
70	53	25	13	222	31	49	0	0	0	86	0	0
80	1,020	906	384	1,065	31	49	76	99	0	86	0	0
90	3,019	4,000	1,744	3,326	2,465	76	76	99	37	86	67	734
100	3,871	4,000	3,871	3,871	4,000	3,871	192	297	118	130	115	4,000
Mean	641	698	502	691	438	216	24	29	12	43	10	379

DW storage (TAF)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	(0)	0	0	(0)	(0)	0	(0)	(0)	(0)
10	0	0	0	0	0	0	0	0	0	(0)	(0)	(0)
20	0	0	0	0	14	56	7	0	0	0	0	0
30	0	0	0	61	174	218	151	110	86	0	0	0
40	0	0	2	236	233	232	196	148	131	5	0	0
50	0	0	148	238	236	235	229	176	155	34	0	0
60	0	196	225	238	238	238	234	209	185	88	0	0
70	39	238	238	238	238	238	234	227	194	138	0	0
80	201	238	238	238	238	238	238	232	225	161	6	0
90	238	238	238	238	238	238	238	238	233	183	80	164
100	238	238	238	238	238	238	238	238	238	238	238	238
Mean	65	105	122	162	175	181	167	148	135	75	23	26

DW discharge for export (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	433	0
70	0	0	0	0	0	0	0	411	0	1,141	987	0
80	0	0	0	0	0	0	616	480	136	2,614	1,888	0
90	0	0	352	0	0	0	768	827	586	3,291	2,679	1,195
100	0	515	3,335	2,708	4,000	2,691	1,332	1,843	2,822	3,741	3,755	3,379
Mean	0	12	215	39	174	78	204	259	130	910	796	304

DW discharge for outflow (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

Final CVP Tracy and SWP Banks exports (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	4,278	3,314	5,051	4,859	6,075	4,123	2,842	2,455	1,145	1,896	597	3,296
10	5,115	5,373	7,351	9,055	6,407	4,723	3,810	3,327	5,500	6,208	3,607	3,617
20	6,844	6,628	8,569	11,036	7,754	6,095	4,662	3,956	5,568	7,611	4,790	5,966
30	7,982	7,360	10,426	11,372	9,746	8,217	4,975	4,464	5,804	10,052	5,143	6,100
40	8,490	8,371	11,114	11,428	11,320	10,191	5,753	5,424	6,202	11,280	6,824	6,405
50	9,045	10,658	11,281	11,562	11,663	11,268	6,573	6,064	6,595	11,280	8,279	6,626
60	9,700	11,280	11,315	11,732	12,097	11,340	7,380	6,581	6,968	11,280	9,116	7,589
70	11,280	11,280	11,399	11,849	12,506	11,461	8,428	7,882	7,148	11,280	10,296	9,087
80	11,280	11,280	11,472	12,266	12,700	11,499	9,203	9,437	8,756	11,280	11,280	10,268
90	11,280	11,280	11,658	12,700	12,700	11,700	9,950	9,950	11,280	11,280	11,280	11,280
100	11,280	11,280	11,700	12,700	12,700	11,700	11,280	11,280	11,280	11,280	11,280	11,280
Mean	8,958	9,113	10,343	11,247	10,664	9,506	6,886	6,484	7,125	9,902	7,694	7,472

Table 3A–8. DeltaSOS Mean Annual Simulation Output for Alternative 2

Water Year	Sac Basin Year Type	Available for DW Diversion (TAF)	Delta Storage (TAF)	Delta Storage Diversion (TAF)	Delta Storage Export (TAF)	Delta Storage Outflow (TAF)	Final Total Export (TAF)	Final QWEST Flow (TAF)	Final Delta Outflow (TAF)	3–Mile Slough Flow (TAF)	Old River Diversion Flow (TAF)	Final Antioch Flow (TAF)	Old & Middle Flow (TAF)
1922	2	1,073	238	257	225	0	6,614	363	11,860	2,587	1,587	2,950	(5,526)
1923	3	2,239	238	246	252	0	6,737	(75)	10,263	2,454	1,369	2,379	(5,862)
1924	5	3	3	3	2	0	4,559	(1,149)	4,161	1,627	825	478	(4,393)
1925	4	774	222	246	200	0	6,003	(982)	7,977	2,415	852	1,433	(5,629)
1926	4	432	238	260	230	0	5,976	(1,309)	6,750	2,312	877	1,003	(5,637)
1927	1	2,854	238	261	237	0	6,854	(424)	17,019	4,219	1,038	3,794	(6,295)
1928	2	2,473	238	287	260	0	7,006	(981)	13,571	3,723	996	2,742	(6,557)
1929	5	0	0	0	0	0	4,583	(906)	4,553	1,583	851	677	(4,338)
1930	4	281	238	244	259	0	5,273	(1,270)	5,996	2,116	764	845	(5,069)
1931	5	0	0	0	0	0	3,341	(301)	3,688	1,051	831	750	(3,120)
1932	4	148	150	148	151	0	4,447	11	5,553	1,309	943	1,320	(4,018)
1933	5	0	0	0	0	0	3,696	(344)	4,295	1,216	853	872	(3,461)
1934	5	121	123	121	132	0	3,889	(564)	4,712	1,432	805	868	(3,683)
1935	3	617	238	351	350	0	6,342	(789)	9,060	2,563	1,100	1,774	(5,740)
1936	3	1,433	238	243	222	0	6,407	(138)	10,603	2,566	1,192	2,428	(5,678)
1937	3	934	238	259	218	0	6,120	522	9,383	1,920	1,494	2,442	(5,071)
1938	1	8,837	238	431	225	0	7,448	4,478	35,514	5,845	3,087	10,323	(4,735)
1939	4	552	238	84	250	0	6,043	(1,299)	5,564	2,035	995	736	(5,674)
1940	2	2,660	238	248	227	0	6,694	(195)	17,381	4,173	1,046	3,978	(6,050)
1941	1	5,968	238	249	224	0	6,893	2,307	29,885	5,717	2,157	8,025	(5,083)
1942	1	5,142	238	260	227	0	7,467	1,242	26,218	5,450	1,534	6,692	(6,379)
1943	1	4,700	238	246	225	0	6,955	1,851	19,334	3,516	1,611	5,367	(5,841)
1944	4	50	43	50	39	0	6,034	(1,281)	6,405	2,217	984	936	(5,612)
1945	3	880	238	253	202	0	6,668	(829)	8,079	2,359	1,254	1,530	(5,948)
1946	3	2,353	238	247	252	0	6,568	(338)	12,747	3,181	1,139	2,843	(6,003)
1947	4	9	5	9	0	0	6,039	(1,599)	5,568	2,199	958	600	(5,693)
1948	3	27	18	27	7	0	6,370	(1,519)	7,320	2,562	806	1,043	(6,145)
1949	4	449	238	233	221	0	5,942	(1,301)	6,880	2,341	842	1,040	(5,689)
1950	3	327	238	248	203	0	6,383	(1,438)	7,302	2,514	866	1,076	(6,106)
1951	2	5,187	238	253	223	0	7,352	1,341	19,621	3,860	1,430	5,201	(6,396)
1952	1	6,016	238	503	220	0	7,761	1,846	26,669	5,223	1,548	7,070	(6,623)
1953	1	2,567	238	6	227	0	7,039	(747)	15,861	4,130	1,084	3,382	(6,511)
1954	2	2,577	238	289	264	0	7,300	(1,479)	13,956	4,089	908	2,610	(7,000)
1955	4	709	238	249	246	0	6,326	(1,729)	5,943	2,354	844	625	(6,037)
1956	1	5,267	238	270	220	0	7,348	1,800	26,583	5,229	1,711	7,029	(6,057)
1957	2	940	238	488	455	0	7,224	(1,711)	9,224	3,111	964	1,400	(6,839)
1958	1	6,698	238	493	225	0	7,868	1,933	31,501	6,297	2,019	8,230	(6,167)
1959	3	1,811	238	192	400	0	6,518	(1,021)	9,621	2,827	997	1,806	(6,113)
1960	4	159	145	159	141	0	5,996	(1,807)	5,903	2,390	802	583	(5,794)
1961	4	227	205	227	198	0	5,974	(1,942)	5,791	2,437	763	495	(5,798)
1962	3	827	222	246	201	0	6,000	(1,199)	7,886	2,516	892	1,318	(5,642)
1963	1	3,055	238	256	220	0	7,358	(761)	17,964	4,621	1,021	3,860	(6,782)
1964	4	1,263	238	312	306	0	6,281	(1,743)	6,635	2,526	869	784	(6,027)
1965	1	3,157	238	429	401	0	7,150	232	19,385	4,414	1,246	4,646	(6,423)
1966	3	1,218	238	248	202	0	7,009	(1,612)	8,312	2,844	1,110	1,232	(6,482)
1967	1	4,461	238	498	226	0	7,853	687	20,539	4,427	1,729	5,113	(6,515)
1968	3	2,134	238	23	207	0	6,763	(1,090)	10,982	3,181	943	2,091	(6,400)
1969	1	6,436	238	497	225	0	7,538	4,309	28,188	4,231	3,097	8,541	(4,853)
1970	1	5,616	238	16	207	0	6,996	1,978	26,262	5,062	1,632	7,040	(5,866)
1971	1	3,002	238	406	375	0	7,349	(752)	16,072	4,180	993	3,428	(6,884)
1972	3	609	238	322	289	0	6,962	(2,201)	6,929	2,847	902	646	(6,696)
1973	2	4,138	238	253	217	0	7,149	418	18,800	4,166	1,204	4,584	(6,292)
1974	1	6,244	238	433	217	0	7,661	1,091	31,036	6,658	1,154	7,749	(6,989)
1975	1	2,724	238	124	213	0	7,818	(316)	15,740	3,864	1,176	3,549	(7,176)
1976	5	567	238	195	231	0	5,326	(1,554)	5,237	2,099	755	546	(5,230)
1977	5	0	0	0	0	0	3,076	(452)	3,658	1,128	676	676	(3,050)
1978	2	2,713	238	243	228	0	5,955	708	15,765	3,301	1,158	4,009	(5,174)
1979	3	1,050	238	432	405	0	6,903	(770)	9,150	2,575	1,220	1,805	(6,192)
1980	2	5,331	238	246	220	0	6,605	3,283	22,567	3,483	2,567	6,766	(4,470)
1981	4	782	238	293	258	0	6,747	(1,630)	7,418	2,647	1,068	1,017	(6,278)
1982	1	8,660	238	509	221	0	8,002	5,930	35,949	5,150	3,355	11,080	(4,974)
1983	1	21,447	238	49	0	0	8,377	18,578	61,128	4,099	9,324	22,677	760
1984	1	8,815	238	11	201	0	7,280	5,714	27,771	3,374	3,669	9,088	(4,156)
1985	4	1,578	238	242	248	0	6,499	(1,150)	7,942	2,503	1,103	1,353	(5,937)
1986	1	6,120	238	250	227	0	6,722	4,514	27,626	3,986	2,756	8,500	(4,328)
1987	4	72	68	72	50	0	5,904	(1,389)	5,794	2,137	919	748	(5,598)
1988	5	417	237	234	244	0	4,700	(1,205)	4,923	1,831	685	626	(4,590)
1989	4	236	232	236	205	0	5,504	(1,567)	6,411	2,377	646	810	(5,452)
1990	5	60	61	60	64	0	4,141	(884)	4,568	1,573	633	690	(4,099)
1991	5	4	4	4	0	0	3,824	(585)	4,858	1,477	634	893	(3,788)
Average		2,575	198	225	202	0	6,364	212	13,912	3,149	1,370	3,361	(5,514)

Notes: Definitions of the categories are provided in Table A2–3 in Appendix 2.
Water–year types: 1=wet, 2=above normal, 3=below normal, 4=dry, 5=critically dry.
Negative values shown in parentheses.

Table 3A–9. Monthly Percentiles for DeltaSOS Simulations for Alternative 2

DW diversion (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	15	0	0	0	0	0	0	0	0
50	0	0	13	15	30	49	0	0	0	0	0	0
60	0	25	13	15	31	49	0	0	0	85	0	0
70	53	25	13	90	31	49	0	0	0	86	0	0
80	1,020	906	384	990	31	49	76	99	0	86	0	0
90	3,019	4,000	1,744	3,326	2,465	657	76	99	37	86	67	734
100	3,871	4,000	3,871	3,871	4,000	3,871	3,125	312	118	130	115	4,000
Mean	641	698	502	658	438	236	92	31	12	43	10	379

DW storage (TAF)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	(0)	(0)	(0)	0	0	(0)	(0)	(0)	(0)
10	0	0	0	0	0	0	0	0	(0)	0	(0)	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	61	14	0	0	0	0	0	0	0
40	0	0	2	226	145	15	30	8	0	0	0	0
50	0	0	174	238	222	226	200	99	0	5	0	0
60	0	196	233	238	238	238	225	169	0	5	0	0
70	39	238	238	238	238	238	234	204	62	5	0	0
80	201	238	238	238	238	238	238	232	147	28	0	0
90	238	238	238	238	238	238	238	238	233	137	4	164
100	238	238	238	238	238	238	238	238	238	238	238	238
Mean	65	105	125	161	147	133	130	111	61	30	9	26

DW discharge for export (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	266	114	0	0	0
80	0	0	0	0	1,065	181	0	457	2,228	443	0	0
90	0	0	123	0	3,353	2,309	414	880	3,283	2,614	933	0
100	0	515	3,335	2,721	4,000	3,822	1,053	3,771	3,780	3,741	3,755	2,861
Mean	0	12	176	54	667	437	81	283	783	497	293	79

DW discharge for outflow (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

Final CVP Tracy and SWP Banks exports (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	4,278	3,314	5,051	4,859	6,090	3,469	2,842	2,455	1,145	1,896	597	3,296
10	5,115	5,373	7,351	9,055	7,140	4,750	3,622	3,174	5,500	4,447	3,508	3,617
20	6,844	6,628	8,569	11,101	9,758	6,363	3,840	3,781	5,568	6,887	4,790	5,915
30	7,982	7,360	10,426	11,380	11,332	10,265	4,414	4,296	5,804	8,729	5,143	6,076
40	8,490	8,371	11,114	11,444	11,633	11,268	5,623	5,362	6,321	10,396	6,183	6,393
50	9,045	10,658	11,265	11,568	11,941	11,268	6,573	6,047	7,001	11,280	7,118	6,568
60	9,700	11,280	11,280	11,768	12,048	11,461	7,380	7,176	8,380	11,280	7,889	6,822
70	11,280	11,280	11,295	11,873	12,462	11,461	8,476	8,380	9,733	11,280	9,116	8,100
80	11,280	11,280	11,393	12,266	12,700	11,499	9,203	9,410	10,551	11,280	10,293	10,087
90	11,280	11,280	11,503	12,700	12,700	11,700	9,950	9,950	11,280	11,280	11,280	11,280
100	11,280	11,280	11,700	12,700	12,700	11,700	11,280	11,280	11,280	11,280	11,280	11,280
Mean	8,958	9,113	10,304	11,261	11,156	9,864	6,764	6,508	7,778	9,489	7,192	7,248

Table 3A-10. DeltaSOS Mean Annual Simulation Output for Alternative 3

Water Year	Sac Basin Year Type	Available for DW Diversion (TAF)	Delta Storage (TAF)	Delta Storage Diversion (TAF)	Delta Storage Export (TAF)	Delta Storage Outflow (TAF)	Final Total Export (TAF)	Final QWEST Flow (TAF)	Final Delta Outflow (TAF)	3-Mile Slough Flow (TAF)	Old River Diversion Flow (TAF)	Final Antioch Flow (TAF)	Old & Middle Flow (TAF)
1922	2	1,073	406	462	368	0	6,773	167	11,664	2,648	1,587	2,816	(5,685)
1923	3	2,247	406	426	424	0	6,916	(236)	10,101	2,504	1,369	2,268	(6,042)
1924	5	4	4	4	0	0	4,579	(1,144)	4,166	1,626	825	482	(4,412)
1925	4	779	333	371	289	0	6,110	(1,099)	7,861	2,452	852	1,353	(5,735)
1926	4	436	383	423	336	0	6,098	(1,463)	6,596	2,360	877	897	(5,759)
1927	1	2,857	406	437	374	0	7,009	(591)	16,852	4,271	1,038	3,680	(6,450)
1928	2	2,476	406	467	390	0	7,151	(1,150)	13,402	3,776	996	2,626	(6,702)
1929	5	0	0	0	0	0	4,604	(901)	4,558	1,581	851	681	(4,359)
1930	4	281	275	281	296	0	5,333	(1,303)	5,963	2,126	764	823	(5,128)
1931	5	0	0	0	0	0	3,363	(297)	3,692	1,050	831	753	(3,142)
1932	4	148	149	148	146	0	4,464	15	5,556	1,308	943	1,323	(4,035)
1933	5	0	0	0	0	0	3,722	(344)	4,295	1,216	853	872	(3,486)
1934	5	121	123	121	130	0	3,910	(560)	4,716	1,431	805	871	(3,704)
1935	3	621	369	484	457	0	6,465	(912)	8,937	2,602	1,100	1,690	(5,863)
1936	3	1,436	406	419	352	0	6,554	(306)	10,435	2,618	1,192	2,312	(5,825)
1937	3	934	406	439	371	0	6,294	347	9,208	1,974	1,494	2,321	(5,245)
1938	1	8,844	406	626	368	0	7,601	4,298	35,334	5,901	3,087	10,199	(4,888)
1939	4	559	406	255	412	0	6,215	(1,454)	5,409	2,084	995	629	(5,846)
1940	2	2,663	406	428	361	0	6,848	(370)	17,206	4,228	1,046	3,858	(6,204)
1941	1	5,971	406	430	374	0	7,058	2,136	29,714	5,771	2,157	7,907	(5,249)
1942	1	5,146	406	446	370	0	7,620	1,072	26,048	5,504	1,534	6,576	(6,532)
1943	1	4,700	406	424	382	0	7,128	1,682	19,165	3,569	1,611	5,251	(6,014)
1944	4	54	43	54	36	0	6,049	(1,277)	6,408	2,216	984	939	(5,627)
1945	3	880	406	441	335	0	6,819	(1,010)	7,898	2,416	1,254	1,406	(6,099)
1946	3	2,359	406	418	416	0	6,744	(495)	12,590	3,230	1,139	2,735	(6,180)
1947	4	17	10	17	0	0	6,053	(1,596)	5,572	2,198	958	603	(5,707)
1948	3	35	18	35	4	0	6,378	(1,512)	7,327	2,560	806	1,048	(6,153)
1949	4	449	369	362	336	0	6,077	(1,424)	6,757	2,379	842	955	(5,824)
1950	3	335	309	335	242	0	6,435	(1,511)	7,228	2,537	866	1,026	(6,158)
1951	2	5,197	406	432	353	0	7,495	1,174	19,455	3,912	1,430	5,087	(6,538)
1952	1	6,021	406	715	370	0	7,922	1,649	26,471	5,285	1,548	6,934	(6,783)
1953	1	2,569	406	154	345	0	7,169	(881)	15,728	4,172	1,084	3,291	(6,640)
1954	2	2,581	406	471	393	0	7,444	(1,649)	13,786	4,142	908	2,493	(7,143)
1955	4	719	406	423	404	0	6,488	(1,881)	5,790	2,402	839	521	(6,204)
1956	1	5,272	406	453	363	0	7,504	1,630	26,413	5,283	1,711	6,912	(6,214)
1957	2	947	406	711	624	0	7,405	(1,921)	9,014	3,176	964	1,256	(7,020)
1958	1	6,701	406	685	368	0	8,018	1,759	31,328	6,352	2,019	8,110	(6,318)
1959	3	1,815	406	367	531	0	6,660	(1,181)	9,461	2,877	997	1,696	(6,254)
1960	4	166	145	166	139	0	6,010	(1,803)	5,907	2,389	802	586	(5,807)
1961	4	231	205	231	195	0	5,989	(1,938)	5,795	2,436	763	498	(5,812)
1962	3	832	333	371	293	0	6,109	(1,315)	7,769	2,553	892	1,237	(5,752)
1963	1	3,057	406	440	363	0	7,512	(930)	17,795	4,674	1,021	3,744	(6,935)
1964	4	1,274	406	491	469	0	6,454	(1,905)	6,472	2,577	869	672	(6,199)
1965	1	3,163	406	594	522	0	7,287	77	19,230	4,463	1,246	4,539	(6,560)
1966	3	1,225	406	425	334	0	7,149	(1,772)	8,152	2,894	1,110	1,123	(6,622)
1967	1	4,468	406	694	316	0	7,952	508	20,360	4,483	1,729	4,991	(6,613)
1968	3	2,138	406	145	335	0	6,901	(1,196)	10,876	3,214	943	2,018	(6,538)
1969	1	6,436	406	806	368	0	7,694	4,013	27,892	4,324	3,097	8,337	(5,009)
1970	1	5,623	406	80	344	0	7,142	1,931	26,215	5,076	1,632	7,008	(6,013)
1971	1	3,009	406	593	498	0	7,484	(925)	15,899	4,234	993	3,309	(7,018)
1972	3	617	406	487	388	0	7,070	(2,349)	6,781	2,893	902	544	(6,805)
1973	2	4,138	406	427	371	0	7,321	253	18,634	4,218	1,204	4,470	(6,463)
1974	1	6,251	406	615	347	0	7,802	924	30,869	6,711	1,154	7,634	(7,130)
1975	1	2,727	406	310	356	0	7,968	(484)	15,572	3,917	1,176	3,433	(7,327)
1976	5	567	406	363	393	0	5,505	(1,712)	5,078	2,149	755	437	(5,408)
1977	5	0	0	0	0	0	3,103	(453)	3,657	1,129	676	676	(3,077)
1978	2	2,713	406	420	365	0	6,115	534	15,591	3,356	1,158	3,890	(5,334)
1979	3	1,052	406	607	531	0	7,045	(936)	8,984	2,627	1,220	1,691	(6,333)
1980	2	5,331	406	417	373	0	6,774	3,121	22,405	3,534	2,567	6,655	(4,639)
1981	4	786	406	467	384	0	6,884	(1,790)	7,258	2,697	1,068	906	(6,416)
1982	1	8,665	406	815	344	0	8,136	5,639	35,658	5,241	3,355	10,880	(5,108)
1983	1	21,455	406	136	0	0	8,377	18,517	61,067	4,118	9,324	22,635	760
1984	1	8,820	406	22	334	0	7,423	5,718	27,775	3,373	3,669	9,091	(4,299)
1985	4	1,584	406	419	407	0	6,668	(1,311)	7,781	2,553	1,103	1,243	(6,106)
1986	1	6,124	406	442	379	0	6,889	4,332	27,444	4,043	2,756	8,374	(4,495)
1987	4	76	68	76	46	0	5,915	(1,382)	5,801	2,135	919	753	(5,609)
1988	5	419	369	366	373	0	4,848	(1,331)	4,797	1,871	685	540	(4,738)
1989	4	244	232	244	174	0	5,487	(1,562)	6,416	2,375	646	813	(5,434)
1990	5	60	61	60	62	0	4,161	(880)	4,572	1,572	633	692	(4,119)
1991	5	4	4	4	0	0	3,848	(583)	4,859	1,477	634	894	(3,812)
Average		2,579	321	356	302	0	6,479	92	13,792	3,186	1,369	3,279	(5,628)

Notes: Definitions of the categories are provided in Table A2-3 in Appendix A2.
Water-year types: 1=wet, 2=above normal, 3=below normal, 4=dry, 5=critically dry.
Negative values shown in parentheses.

Table 3A-11. Monthly Percentiles for DeltaSOS Simulations for Alternative 3

DW diversion (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	29	0	0	0	0	0	0	0	0
50	0	0	26	29	59	98	0	0	0	0	0	0
60	0	50	26	102	61	98	0	0	0	157	0	0
70	106	235	822	632	61	98	0	0	0	158	0	0
80	2,452	2,434	1,111	1,593	704	98	151	198	0	158	0	0
90	3,763	5,702	4,227	3,326	3,207	773	151	198	37	158	123	778
100	6,000	6,000	6,000	6,000	6,000	6,000	3,000	484	235	260	231	6,000
Mean	996	1,152	964	976	761	322	110	55	24	80	19	445

DW storage (TAF)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	(0)	(0)	(0)	0	0	(0)	(0)	(0)	(0)
10	0	0	0	0	0	(0)	0	0	(0)	0	0	0
20	0	0	0	0	1	0	0	0	0	0	0	0
30	0	0	0	102	107	0	0	0	0	0	0	0
40	0	0	5	275	265	123	129	102	0	10	0	0
50	0	0	248	369	337	364	360	234	37	10	0	0
60	0	197	369	406	406	406	387	312	95	31	0	0
70	42	357	402	406	406	406	397	368	209	66	0	0
80	201	406	406	406	406	406	406	394	298	160	8	0
90	406	406	406	406	406	406	406	406	394	275	64	166
100	406	406	406	406	406	406	406	406	406	406	406	406
Mean	94	161	208	263	259	232	227	206	127	76	21	34

DW discharge for export (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	139	0	271	1,018	0	323	0
80	0	0	0	0	1,184	1,104	29	416	3,283	1,460	873	0
90	0	0	123	0	3,530	2,568	416	839	4,674	2,677	3,435	695
100	425	473	3,740	2,717	6,000	4,975	1,030	3,000	4,899	6,000	5,237	3,917
Mean	6	10	179	58	784	678	91	270	1,187	777	777	191

DW discharge for outflow (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

Final CVP Tracy and SWP Banks exports (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	4,329	3,356	5,087	4,862	6,108	3,360	2,865	2,496	1,207	1,968	653	3,340
10	5,166	5,415	7,387	9,055	7,109	4,810	3,645	3,215	5,500	5,172	3,564	3,661
20	6,895	6,670	8,605	11,101	10,454	7,142	3,873	3,781	5,613	7,470	4,957	5,959
30	8,033	7,402	10,462	11,380	11,632	11,079	4,797	4,300	5,864	9,807	5,199	6,144
40	8,541	8,413	11,176	11,460	11,663	11,268	5,623	5,456	6,550	11,280	7,214	6,449
50	9,096	10,700	11,259	11,578	12,009	11,268	6,573	6,047	8,152	11,280	8,082	6,614
60	9,751	11,280	11,280	11,768	12,097	11,461	7,380	7,176	9,645	11,280	8,944	7,028
70	11,280	11,280	11,298	11,873	12,462	11,461	8,476	8,380	11,280	11,280	10,217	8,266
80	11,280	11,280	11,393	12,266	12,700	11,574	9,203	9,410	11,280	11,280	11,280	10,514
90	11,280	11,280	11,503	12,700	12,700	11,700	9,950	9,950	11,280	11,280	11,280	11,280
100	11,280	11,280	11,700	12,700	12,700	11,700	11,280	11,280	11,280	11,280	11,280	11,280
Mean	8,998	9,134	10,323	11,267	11,275	10,104	6,783	6,517	8,199	9,806	7,723	7,398

Table 3A-12. DeltaSOS Mean Annual Simulation Output for the No-Project Alternative under Cumulative Conditions

Water Year	Sac Basin Year Type	Available for DW Diversion (TAF)	Delta Storage (TAF)	Delta Storage Diversion (TAF)	Delta Storage Export (TAF)	Delta Storage Outflow (TAF)	Final Total Export (TAF)	Final QWEST Flow (TAF)	Final Delta Outflow (TAF)	3-Mile Slough Flow (TAF)	Old River Diversion Flow (TAF)	Final Antioch Flow (TAF)
1922	2	276	0	0	0	0	7,177	(193)	11,304	2,761	1,587	2,568
1923	3	1,512	0	0	0	0	7,210	(579)	9,759	2,612	1,369	2,033
1924	5	0	0	0	0	0	4,542	(1,154)	4,155	1,629	825	475
1925	4	597	0	0	0	0	5,969	(926)	8,033	2,398	852	1,471
1926	4	201	0	0	0	0	5,966	(1,294)	6,765	2,307	877	1,013
1927	1	1,964	0	0	0	0	7,494	(1,065)	16,379	4,419	1,038	3,355
1928	2	1,823	0	0	0	0	7,374	(1,347)	13,205	3,838	996	2,491
1929	5	0	0	0	0	0	4,564	(911)	4,548	1,585	851	673
1930	4	85	0	0	0	0	5,196	(1,233)	6,033	2,104	764	871
1931	5	0	0	0	0	0	3,327	(312)	3,677	1,054	831	743
1932	4	0	0	0	0	0	4,420	10	5,552	1,309	943	1,320
1933	5	0	0	0	0	0	3,678	(351)	4,288	1,218	853	867
1934	5	0	0	0	0	0	3,855	(566)	4,710	1,433	805	867
1935	3	335	0	0	0	0	6,263	(734)	9,115	2,546	1,100	1,812
1936	3	1,139	0	0	0	0	6,487	(223)	10,518	2,592	1,192	2,370
1937	3	657	0	0	0	0	6,167	491	9,352	1,929	1,494	2,420
1938	1	7,361	0	0	0	0	8,687	3,419	34,455	6,176	3,087	9,596
1939	4	203	0	0	0	0	6,127	(1,574)	5,289	2,121	995	547
1940	2	2,037	0	0	0	0	7,070	(575)	17,001	4,292	1,046	3,717
1941	1	5,154	0	0	0	0	7,473	1,727	29,305	5,899	2,157	7,627
1942	1	4,079	0	0	0	0	8,293	425	25,401	5,706	1,534	6,132
1943	1	3,663	0	0	0	0	7,749	1,053	18,536	3,766	1,611	4,819
1944	4	0	0	0	0	0	6,031	(1,292)	6,394	2,221	984	929
1945	3	656	0	0	0	0	6,712	(847)	8,062	2,365	1,254	1,518
1946	3	1,793	0	0	0	0	6,895	(695)	12,390	3,293	1,135	2,598
1947	4	0	0	0	0	0	6,033	(1,609)	5,558	2,203	958	593
1948	3	0	0	0	0	0	6,382	(1,536)	7,303	2,567	806	1,031
1949	4	254	0	0	0	0	5,903	(1,275)	6,906	2,333	842	1,057
1950	3	21	0	0	0	0	6,475	(1,509)	7,230	2,536	866	1,027
1951	2	4,503	0	0	0	0	7,812	886	19,166	4,003	1,430	4,889
1952	1	4,681	0	0	0	0	8,868	997	25,819	5,490	1,548	6,486
1953	1	1,918	0	0	0	0	7,451	(1,405)	15,204	4,336	1,084	2,931
1954	2	1,496	0	0	0	0	8,099	(2,278)	13,158	4,339	908	2,061
1955	4	319	0	0	0	0	6,459	(1,884)	5,788	2,403	839	519
1956	1	4,550	0	0	0	0	7,846	1,328	26,111	5,377	1,711	6,705
1957	2	361	0	0	0	0	7,332	(1,811)	9,125	3,142	964	1,331
1958	1	5,027	0	0	0	0	9,299	744	30,313	6,670	2,019	7,414
1959	3	1,191	0	0	0	0	6,717	(1,453)	9,189	2,962	997	1,509
1960	4	0	0	0	0	0	6,000	(1,817)	5,894	2,393	802	576
1961	4	45	0	0	0	0	5,945	(1,908)	5,825	2,427	763	518
1962	3	679	0	0	0	0	5,932	(1,111)	7,974	2,489	892	1,378
1963	1	2,088	0	0	0	0	8,092	(1,484)	17,242	4,847	1,021	3,364
1964	4	756	0	0	0	0	6,467	(1,947)	6,431	2,590	869	644
1965	1	2,633	0	0	0	0	7,252	133	19,286	4,445	1,246	4,578
1966	3	726	0	0	0	0	7,285	(1,867)	8,057	2,924	1,110	1,057
1967	1	3,092	0	0	0	0	8,990	(203)	19,649	4,706	1,729	4,503
1968	3	1,224	0	0	0	0	7,449	(1,985)	10,087	3,462	943	1,477
1969	1	5,106	0	0	0	0	8,636	3,459	27,337	4,498	3,097	7,957
1970	1	4,600	0	0	0	0	7,789	969	25,253	5,378	1,632	6,347
1971	1	2,192	0	0	0	0	7,771	(1,168)	15,656	4,310	993	3,142
1972	3	76	0	0	0	0	7,190	(2,421)	6,709	2,916	902	495
1973	2	3,238	0	0	0	0	7,818	(240)	18,142	4,372	1,204	4,132
1974	1	5,056	0	0	0	0	8,619	323	30,268	6,899	1,154	7,222
1975	1	1,805	0	0	0	0	8,513	(1,125)	14,930	4,118	1,176	2,993
1976	5	131	0	0	0	0	5,515	(1,803)	4,987	2,178	755	374
1977	5	0	0	0	0	0	3,053	(453)	3,657	1,129	676	676
1978	2	2,135	0	0	0	0	6,295	358	15,415	3,411	1,158	3,769
1979	3	488	0	0	0	0	7,047	(913)	9,007	2,620	1,220	1,707
1980	2	4,573	0	0	0	0	7,161	2,727	22,011	3,657	2,567	6,384
1981	4	271	0	0	0	0	6,984	(1,857)	7,191	2,718	1,068	861
1982	1	7,155	0	0	0	0	9,279	4,916	34,935	5,468	3,355	10,384
1983	1	19,190	0	0	0	0	10,631	16,348	58,898	4,798	9,324	21,146
1984	1	7,825	0	0	0	0	8,100	4,679	26,736	3,699	3,669	8,378
1985	4	1,002	0	0	0	0	6,811	(1,492)	7,600	2,610	1,103	1,118
1986	1	5,487	0	0	0	0	7,119	4,115	27,227	4,111	2,756	8,225
1987	4	0	0	0	0	0	5,911	(1,398)	5,785	2,140	919	742
1988	5	218	0	0	0	0	4,640	(1,180)	4,948	1,823	685	643
1989	4	24	0	0	0	0	5,500	(1,556)	6,422	2,374	646	817
1990	5	0	0	0	0	0	4,123	(894)	4,557	1,577	633	682
1991	5	0	0	0	0	0	3,808	(589)	4,853	1,479	634	890
Average		1,995	0	0	0	0	6,730	(156)	13,544	3,264	1,369	3,108

Notes: Definitions of the categories are provided in Table A2-3 in Appendix 2.
Water-year types: 1=wet, 2=above normal, 3=below normal, 4=dry, 5=critically dry.
Negative values shown in parentheses.

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Table 3A–13. Monthly Percentiles for DeltaSOS Simulations for the No–Project Alternative under Cumulative Conditions

DW diversion (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

DW storage (TAF)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

DW discharge for export (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

DW discharge for outflow (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

Final CVP Tracy and SWP Banks exports (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	4,288	3,326	5,072	4,844	4,073	3,147	2,791	2,395	1,076	1,818	537	3,271
10	5,125	5,385	7,368	8,686	6,384	4,525	3,571	3,114	5,464	3,427	3,448	3,592
20	6,854	6,640	7,842	10,935	7,285	6,095	3,789	3,538	5,568	6,446	4,730	5,890
30	7,992	7,372	9,922	11,575	9,184	7,956	4,189	3,928	5,766	7,379	5,083	6,051
40	8,500	8,383	10,868	13,474	11,137	10,191	5,623	4,859	5,923	8,865	5,864	6,359
50	9,055	10,670	11,667	14,500	14,500	11,701	6,552	5,685	6,313	10,505	6,324	6,518
60	9,710	12,488	13,050	14,500	14,500	13,992	7,380	6,754	6,543	11,287	7,174	6,685
70	11,921	14,219	14,500	14,500	14,500	14,500	8,921	7,487	7,026	11,288	7,966	7,409
80	14,542	14,900	14,500	14,500	14,500	14,500	10,960	8,829	8,448	11,288	9,615	10,062
90	14,900	14,900	14,500	14,500	14,500	14,500	11,760	11,760	11,317	11,288	11,287	14,004
100	14,900	14,900	14,500	14,500	14,500	14,500	14,900	14,900	14,900	14,900	14,155	14,900
Mean	9,968	10,424	11,479	12,759	11,671	10,752	7,249	6,614	7,326	9,026	6,889	7,552

Table 3A-14. DeltaSOS Mean Annual Simulation Output for Alternative 1 under Cumulative Conditions

Water Year	Sac Basin Year Type	Available for DW Diversion (TAF)	Delta Storage (TAF)	Delta Storage Diversion (TAF)	Delta Storage Export (TAF)	Delta Storage Outflow (TAF)	Final Total Export (TAF)	Final QWEST Flow (TAF)	Final Delta Outflow (TAF)	3-Mile Slough Flow (TAF)	Old River Diversion Flow (TAF)	Final Antioch Flow (TAF)	Old & Middle Flow (TAF)
1922	2	276	238	263	219	0	7,404	(440)	11,057	2,839	1,587	2,399	(6,316)
1923	3	1,512	238	238	241	0	7,453	(794)	9,544	2,679	1,369	1,885	(6,579)
1924	5	0	0	0	0	0	4,561	(1,149)	4,161	1,627	825	478	(4,395)
1925	4	597	222	241	190	0	6,171	(1,155)	7,804	2,469	852	1,315	(5,797)
1926	4	201	186	201	154	0	6,130	(1,481)	6,578	2,366	877	885	(5,791)
1927	1	1,965	238	274	243	0	7,749	(1,326)	16,118	4,501	1,038	3,175	(7,190)
1928	2	1,828	238	247	208	0	7,600	(1,587)	12,966	3,913	996	2,326	(7,151)
1929	5	0	0	0	0	0	4,583	(906)	4,553	1,583	851	677	(4,338)
1930	4	85	86	85	72	0	5,282	(1,307)	5,959	2,127	764	820	(5,078)
1931	5	0	0	0	0	0	3,341	(301)	3,688	1,051	831	750	(3,120)
1932	4	0	0	0	0	0	4,444	11	5,553	1,309	943	1,320	(4,014)
1933	5	0	0	0	0	0	3,696	(344)	4,295	1,216	853	872	(3,461)
1934	5	0	0	0	0	0	3,878	(564)	4,712	1,432	805	868	(3,672)
1935	3	335	238	237	207	0	6,481	(957)	8,892	2,616	1,100	1,659	(5,879)
1936	3	1,139	238	235	206	0	6,685	(424)	10,317	2,655	1,192	2,231	(5,956)
1937	3	657	238	259	214	0	6,392	245	9,106	2,006	1,494	2,251	(5,343)
1938	1	7,363	238	265	225	0	8,922	3,170	34,205	6,255	3,087	9,424	(6,209)
1939	4	203	207	203	172	0	6,315	(1,767)	5,096	2,182	995	414	(5,946)
1940	2	2,041	238	242	214	0	7,299	(808)	16,768	4,365	1,046	3,558	(6,655)
1941	1	5,155	238	249	219	0	7,700	1,494	29,072	5,972	2,157	7,466	(5,890)
1942	1	4,080	238	247	213	0	8,515	193	25,169	5,779	1,534	5,972	(7,427)
1943	1	3,664	238	243	210	0	7,976	817	18,300	3,840	1,611	4,657	(6,863)
1944	4	0	0	0	0	0	6,045	(1,281)	6,405	2,217	984	936	(5,623)
1945	3	656	222	241	190	0	6,880	(1,041)	7,867	2,426	1,254	1,384	(6,160)
1946	3	1,792	238	234	242	0	7,118	(885)	12,200	3,353	1,139	2,468	(6,553)
1947	4	0	0	0	0	0	6,048	(1,599)	5,568	2,199	958	600	(5,702)
1948	3	0	0	0	0	0	6,390	(1,519)	7,320	2,562	806	1,043	(6,165)
1949	4	254	238	233	208	0	6,123	(1,495)	6,685	2,402	842	906	(5,870)
1950	3	21	22	21	6	0	6,492	(1,517)	7,223	2,539	866	1,022	(6,215)
1951	2	4,502	238	244	206	0	8,021	663	18,943	4,073	1,430	4,736	(7,065)
1952	1	4,681	238	303	225	0	9,100	711	25,534	5,579	1,548	6,290	(7,962)
1953	1	1,917	238	194	206	0	7,668	(1,585)	15,023	4,392	1,084	2,807	(7,139)
1954	2	1,497	238	419	383	0	8,498	(2,688)	12,747	4,468	908	1,780	(8,198)
1955	4	319	238	234	204	0	6,671	(2,102)	5,570	2,471	839	369	(6,387)
1956	1	4,549	238	249	219	0	8,064	1,103	25,887	5,447	1,711	6,551	(6,773)
1957	2	361	209	361	335	0	7,683	(2,163)	8,773	3,252	964	1,090	(7,298)
1958	1	5,034	238	271	225	0	9,532	491	30,060	6,749	2,019	7,240	(7,832)
1959	3	1,192	238	427	428	0	7,165	(1,875)	8,768	3,094	997	1,220	(6,759)
1960	4	0	0	0	0	0	6,015	(1,807)	5,903	2,390	802	583	(5,812)
1961	4	45	41	45	34	0	5,993	(1,942)	5,791	2,437	763	495	(5,817)
1962	3	679	222	241	192	0	6,139	(1,342)	7,743	2,561	892	1,219	(5,782)
1963	1	2,087	238	303	267	0	8,374	(1,776)	16,949	4,939	1,021	3,163	(7,797)
1964	4	756	238	435	397	0	6,879	(2,372)	6,006	2,724	849	352	(6,645)
1965	1	2,633	238	247	217	0	7,490	(110)	19,043	4,521	1,246	4,411	(6,763)
1966	3	726	238	243	204	0	7,501	(2,097)	7,826	2,996	1,110	899	(6,974)
1967	1	3,091	238	272	218	0	9,215	(457)	19,395	4,785	1,729	4,328	(7,877)
1968	3	1,224	238	226	206	0	7,672	(2,203)	9,869	3,530	943	1,327	(7,310)
1969	1	5,106	238	400	219	0	8,861	3,077	26,955	4,618	3,097	7,694	(6,176)
1970	1	4,599	238	98	208	0	8,014	879	25,163	5,406	1,632	6,285	(6,885)
1971	1	2,192	238	433	417	0	8,202	(1,590)	15,234	4,442	993	2,853	(7,737)
1972	3	76	78	76	61	0	7,268	(2,488)	6,642	2,937	902	449	(7,002)
1973	2	3,239	238	244	209	0	8,041	(472)	17,910	4,445	1,204	3,973	(7,184)
1974	1	5,060	238	252	213	0	8,841	86	30,032	6,973	1,154	7,060	(8,170)
1975	1	1,805	238	257	208	0	8,731	(1,368)	14,688	4,194	1,176	2,826	(8,090)
1976	5	131	132	131	128	0	5,659	(1,926)	4,864	2,216	755	290	(5,563)
1977	5	0	0	0	0	0	3,076	(452)	3,658	1,128	676	676	(3,050)
1978	2	2,136	238	243	213	0	6,517	131	15,188	3,482	1,158	3,613	(5,737)
1979	3	488	238	235	206	0	7,266	(1,135)	8,785	2,689	1,220	1,554	(6,555)
1980	2	4,574	238	239	209	0	7,350	2,533	21,817	3,718	2,567	6,251	(5,215)
1981	4	271	238	233	205	0	7,204	(2,081)	6,967	2,788	1,068	707	(6,736)
1982	1	7,154	238	492	219	0	9,505	4,441	34,460	5,617	3,355	10,057	(6,477)
1983	1	19,189	238	98	41	0	10,676	16,271	58,821	4,822	9,324	21,093	(1,539)
1984	1	7,824	238	11	208	0	8,277	4,723	26,780	3,685	3,669	8,408	(5,153)
1985	4	1,001	238	242	204	0	7,031	(1,726)	7,366	2,683	1,103	958	(6,469)
1986	1	5,489	238	259	208	0	7,335	3,873	26,985	4,187	2,756	8,059	(4,941)
1987	4	0	0	0	0	0	5,926	(1,389)	5,794	2,137	919	748	(5,620)
1988	5	218	223	218	190	0	4,844	(1,388)	4,740	1,889	685	501	(4,735)
1989	4	24	25	24	14	0	5,526	(1,567)	6,411	2,377	646	810	(5,473)
1990	5	0	0	0	0	0	4,137	(884)	4,568	1,573	633	690	(4,095)
1991	5	0	0	0	0	0	3,828	(585)	4,858	1,477	634	893	(3,792)
Average		1,996	173	191	166	0	6,907	(333)	13,367	3,320	1,369	2,987	(6,056)

Notes: Definitions of the categories are provided in Table A2-3 in Appendix 2.
Water-year types: 1=wet, 2=above normal, 3=below normal, 4=dry, 5=critically dry.
Negative values shown in parentheses.

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Table 3A–15. Monthly Percentiles for DeltaSOS Simulations for Alternative 1 under Cumulative Conditions

DW diversion (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	15	30	0	0	0	0	0	0	0
60	0	0	0	15	31	0	0	0	0	0	0	0
70	0	0	13	15	31	49	0	0	0	0	0	0
80	0	517	839	620	31	49	76	0	0	0	0	0
90	1,815	4,000	3,871	3,871	2,790	49	76	99	0	0	0	0
100	3,871	4,000	3,871	3,871	4,000	3,871	1,068	1,572	118	130	0	3,888
Mean	415	613	617	702	443	173	35	36	8	2	0	123

DW storage (TAF)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	(0)	0	0	0	(0)	(0)	0	(0)	(0)	0
10	0	0	0	0	0	0	0	0	0	(0)	0	0
20	0	0	0	0	0	0	0	0	0	(0)	0	0
30	0	0	0	0	29	70	12	0	0	(0)	0	0
40	0	0	0	77	186	183	153	110	86	0	0	0
50	0	0	0	238	222	229	207	147	132	0	0	0
60	0	0	83	238	238	236	235	231	198	182	0	0	0
70	0	124	238	238	238	238	234	224	193	0	0	0
80	0	204	238	238	238	238	238	232	220	0	0	0
90	203	238	238	238	238	238	238	238	231	0	0	0
100	238	238	238	238	238	238	238	238	238	238	189	238
Mean	35	69	96	139	153	157	147	130	118	5	3	10

DW discharge for export (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	1,079	0	0
50	0	0	0	0	0	0	0	0	0	2,000	0	0
60	0	0	0	0	0	0	0	0	0	2,302	0	0
70	0	0	0	0	0	0	0	52	0	2,977	0	0
80	0	0	0	0	0	0	0	456	136	3,378	0	0
90	0	0	0	0	0	0	637	703	586	3,627	0	0
100	0	2,543	3,313	0	4,000	2,691	1,332	2,428	2,822	3,741	1,379	0
Mean	0	45	171	0	169	71	140	236	130	1,759	29	0

DW discharge for outflow (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

Final CVP Tracy and SWP Banks exports (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	4,278	3,314	5,051	4,859	6,075	3,220	2,842	2,455	1,145	1,896	597	3,296
10	5,115	5,373	7,347	8,701	6,407	4,525	3,672	3,267	5,500	6,208	3,508	3,617
20	6,844	6,628	7,821	10,950	7,754	6,095	4,071	3,691	5,568	7,611	4,790	5,915
30	7,982	7,360	10,347	11,590	9,746	8,217	4,908	4,375	5,804	9,978	5,143	6,076
40	8,490	8,371	11,155	13,474	11,320	10,191	5,753	5,424	6,202	11,365	5,924	6,384
50	9,045	10,658	12,309	14,500	14,500	12,287	6,573	6,047	6,595	11,366	6,699	6,543
60	9,700	12,910	13,448	14,500	14,500	13,992	7,380	6,581	6,968	12,180	7,367	6,710
70	11,911	14,219	14,500	14,500	14,500	14,500	8,921	7,882	7,148	12,880	8,026	7,434
80	14,542	14,900	14,500	14,500	14,500	14,500	10,960	9,632	8,756	13,530	9,675	10,087
90	14,900	14,900	14,500	14,500	14,500	14,500	11,760	11,760	11,317	14,202	11,347	14,029
100	14,900	14,900	14,500	14,500	14,500	14,500	14,900	14,900	14,900	14,900	14,900	14,900
Mean	9,962	10,461	11,640	12,762	11,842	10,832	7,379	6,866	7,476	10,862	6,979	7,575

Table 3A–16. DeltaSOS Mean Annual Simulation Output for Alternative 2 under Cumulative Conditions

Water Year	Sac Basin Year Type	Available for DW Diversion (TAF)	Delta Storage (TAF)	Delta Storage Diversion (TAF)	Delta Storage Export (TAF)	Delta Storage Outflow (TAF)	Final Total Export (TAF)	Final QWEST Flow (TAF)	Final Delta Outflow (TAF)	3–Mile Slough Flow (TAF)	Old River Diversion Flow (TAF)	Final Antioch Flow (TAF)	Old & Middle Flow (TAF)
1922	2	276	220	276	232	0	7,417	(453)	11,044	2,843	1,587	2,390	(6,330)
1923	3	1,512	238	238	252	0	7,464	(794)	9,544	2,679	1,369	1,885	(6,589)
1924	5	0	0	0	0	0	4,561	(1,149)	4,161	1,627	825	478	(4,395)
1925	4	597	222	241	215	0	6,196	(1,155)	7,804	2,469	852	1,315	(5,821)
1926	4	201	186	201	179	0	6,155	(1,481)	6,578	2,366	877	885	(5,816)
1927	1	1,965	238	274	257	0	7,763	(1,326)	16,118	4,501	1,038	3,175	(7,204)
1928	2	1,828	238	558	546	0	7,937	(1,898)	12,654	4,010	996	2,113	(7,488)
1929	5	0	0	0	0	0	4,583	(906)	4,553	1,583	851	677	(4,338)
1930	4	85	86	85	92	0	5,302	(1,307)	5,959	2,127	764	820	(5,098)
1931	5	0	0	0	0	0	3,341	(301)	3,688	1,051	831	750	(3,120)
1932	4	0	0	0	0	0	4,444	11	5,553	1,309	943	1,320	(4,014)
1933	5	0	0	0	0	0	3,696	(344)	4,295	1,216	853	872	(3,461)
1934	5	0	0	0	0	0	3,878	(564)	4,712	1,432	805	868	(3,672)
1935	3	335	238	237	252	0	6,526	(957)	8,892	2,616	1,100	1,659	(5,924)
1936	3	1,139	238	235	214	0	6,692	(424)	10,317	2,655	1,192	2,231	(5,963)
1937	3	657	238	259	218	0	6,397	245	9,106	2,006	1,494	2,251	(5,348)
1938	1	7,363	238	265	225	0	8,922	3,170	34,205	6,255	3,087	9,424	(6,209)
1939	4	203	207	203	204	0	6,347	(1,767)	5,096	2,182	995	414	(5,977)
1940	2	2,041	238	242	227	0	7,312	(808)	16,768	4,365	1,046	3,558	(6,668)
1941	1	5,155	238	249	234	0	7,715	1,494	29,072	5,972	2,157	7,466	(5,906)
1942	1	4,080	238	375	338	0	8,640	65	25,041	5,819	1,534	5,884	(7,552)
1943	1	3,664	238	243	220	0	7,986	817	18,300	3,840	1,611	4,657	(6,873)
1944	4	0	0	0	0	0	6,045	(1,281)	6,405	2,217	984	936	(5,623)
1945	3	656	222	241	205	0	6,896	(1,041)	7,867	2,426	1,254	1,384	(6,175)
1946	3	1,792	238	234	252	0	7,128	(885)	12,200	3,353	1,139	2,468	(6,564)
1947	4	0	0	0	0	0	6,048	(1,599)	5,568	2,199	958	600	(5,702)
1948	3	0	0	0	0	0	6,390	(1,519)	7,320	2,562	806	1,043	(6,165)
1949	4	254	238	233	221	0	6,136	(1,495)	6,685	2,402	842	906	(5,884)
1950	3	21	22	21	22	0	6,507	(1,517)	7,223	2,539	866	1,022	(6,230)
1951	2	4,502	238	244	216	0	8,031	663	18,943	4,073	1,430	4,736	(7,075)
1952	1	4,681	238	303	225	0	9,100	711	25,534	5,579	1,548	6,290	(7,962)
1953	1	1,917	238	299	359	0	7,821	(1,690)	14,919	4,425	1,084	2,735	(7,293)
1954	2	1,497	238	419	397	0	8,512	(2,688)	12,747	4,468	908	1,780	(8,212)
1955	4	319	238	234	252	0	6,720	(2,102)	5,570	2,471	839	369	(6,436)
1956	1	4,549	238	258	231	0	8,076	1,095	25,878	5,450	1,711	6,545	(6,785)
1957	2	361	209	361	347	0	7,695	(2,163)	8,773	3,252	964	1,090	(7,310)
1958	1	5,034	238	271	225	0	9,532	491	30,060	6,749	2,019	7,240	(7,832)
1959	3	1,192	238	427	434	0	7,171	(1,875)	8,768	3,094	997	1,220	(6,766)
1960	4	0	0	0	0	0	6,015	(1,807)	5,903	2,390	802	583	(5,812)
1961	4	45	41	45	37	0	5,997	(1,942)	5,791	2,437	763	495	(5,820)
1962	3	679	222	241	215	0	6,162	(1,342)	7,743	2,561	892	1,219	(5,804)
1963	1	2,087	238	591	541	0	8,647	(2,064)	16,661	5,029	1,021	2,966	(8,071)
1964	4	756	238	474	477	0	6,958	(2,411)	5,967	2,736	849	325	(6,724)
1965	1	2,633	238	336	320	0	7,593	(199)	18,954	4,549	1,246	4,350	(6,866)
1966	3	726	238	334	340	0	7,638	(2,189)	7,735	3,025	1,110	836	(7,110)
1967	1	3,091	238	272	218	0	9,215	(457)	19,395	4,785	1,729	4,328	(7,877)
1968	3	1,224	238	422	406	0	7,872	(2,399)	9,673	3,591	943	1,192	(7,509)
1969	1	5,106	238	400	220	0	8,863	3,077	26,955	4,618	3,097	7,694	(6,177)
1970	1	4,599	238	98	209	0	8,015	879	25,163	5,406	1,632	6,285	(6,885)
1971	1	2,192	238	462	449	0	8,234	(1,619)	15,205	4,451	993	2,833	(7,769)
1972	3	76	78	76	74	0	7,281	(2,488)	6,642	2,937	902	449	(7,015)
1973	2	3,239	238	244	223	0	8,055	(472)	17,910	4,445	1,204	3,973	(7,198)
1974	1	5,060	238	252	228	0	8,856	86	30,032	6,973	1,154	7,060	(8,185)
1975	1	1,805	238	343	307	0	8,830	(1,454)	14,602	4,221	1,176	2,767	(8,189)
1976	5	131	132	131	128	0	5,659	(1,926)	4,864	2,216	755	290	(5,563)
1977	5	0	0	0	0	0	3,076	(452)	3,658	1,128	676	676	(3,050)
1978	2	2,136	238	243	228	0	6,532	131	15,188	3,482	1,158	3,613	(5,751)
1979	3	488	238	235	218	0	7,277	(1,135)	8,785	2,689	1,220	1,554	(6,566)
1980	2	4,574	238	239	220	0	7,361	2,533	21,817	3,718	2,567	6,251	(5,226)
1981	4	271	238	233	248	0	7,247	(2,081)	6,967	2,788	1,068	707	(6,779)
1982	1	7,154	238	492	225	0	9,512	4,441	34,460	5,617	3,355	10,057	(6,484)
1983	1	19,189	238	98	41	0	10,676	16,271	58,821	4,822	9,324	21,093	(1,539)
1984	1	7,824	238	11	208	0	8,277	4,723	26,780	3,685	3,669	8,408	(5,153)
1985	4	1,001	238	242	238	0	7,065	(1,726)	7,366	2,683	1,103	958	(6,503)
1986	1	5,489	238	259	223	0	7,349	3,873	26,985	4,187	2,756	8,059	(4,956)
1987	4	0	0	0	0	0	5,926	(1,389)	5,794	2,137	919	748	(5,620)
1988	5	218	223	218	231	0	4,886	(1,388)	4,740	1,889	685	501	(4,777)
1989	4	24	25	24	14	0	5,526	(1,567)	6,411	2,377	646	810	(5,473)
1990	5	0	0	0	0	0	4,137	(884)	4,568	1,573	633	690	(4,095)
1991	5	0	0	0	0	0	3,828	(585)	4,858	1,477	634	893	(3,792)
Average		1,996	173	211	197	0	6,938	(353)	13,347	3,326	1,369	2,973	(6,087)

Notes: Definitions of the categories are provided in Table A2–3 in Appendix 2.
Water–year types: 1=wet, 2=above normal, 3=below normal, 4=dry, 5=critically dry.
Negative values shown in parentheses.

C–060467

Table 3A-17. Monthly Percentiles for DeltaSOS Simulations for Alternative 2 under Cumulative Conditions

DW diversion (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	15	30	0	0	0	0	0	0	0
60	0	0	0	15	31	0	0	0	0	0	0	0
70	0	0	13	15	31	49	0	0	0	0	0	0
80	0	517	1,260	1,676	31	49	76	0	0	0	0	0
90	1,815	4,000	3,871	3,871	2,899	307	76	99	0	0	0	0
100	3,871	4,000	3,871	3,871	4,000	3,871	2,795	1,791	118	130	0	3,888
Mean	415	613	644	811	501	226	111	41	8	2	0	123

DW Storage (TAF)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	(0)	0	(0)	(0)	0	(0)	(0)	(0)	(0)	0
10	0	0	0	0	0	0	0	0	(0)	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	14	0	0	0	0	0	0	0
50	0	0	0	238	56	0	9	0	0	0	0	0
60	0	0	0	238	222	121	169	99	0	0	0	0
70	0	86	238	238	238	238	230	169	0	0	0	0
80	0	150	238	238	238	238	234	227	18	0	0	0
90	203	238	238	238	238	238	238	238	190	0	0	0
100	238	238	238	238	238	238	238	238	238	238	189	238
Mean	35	62	86	129	120	100	102	88	37	5	3	10

DW discharge for export (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	52	0	0	494	0	0	0
80	0	0	0	0	360	508	0	67	2,152	0	0	0
90	0	0	1,387	0	3,840	2,726	139	664	3,414	2,268	0	0
100	0	2,543	3,858	2,703	4,000	3,822	562	3,698	3,882	3,741	1,379	0
Mean	0	160	254	90	651	507	45	212	817	500	29	0

DW discharge for outflow (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

Final CVP Tracy and SWP Banks exports (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	4,278	3,314	5,051	4,859	6,075	3,220	2,842	2,455	1,145	1,896	597	3,296
10	5,115	5,373	7,347	8,701	6,836	4,706	3,622	3,174	5,500	4,447	3,508	3,617
20	6,844	6,628	7,821	10,950	8,462	6,276	3,840	3,598	5,568	6,832	4,790	5,915
30	7,982	7,360	9,901	11,590	10,331	9,000	4,240	4,033	5,804	8,143	5,143	6,076
40	8,490	8,371	11,134	14,147	13,939	11,285	5,623	4,976	6,267	9,710	5,924	6,384
50	9,045	10,658	12,749	14,500	14,500	13,755	6,573	5,858	6,976	11,365	6,699	6,543
60	9,700	13,308	14,106	14,500	14,500	14,500	7,380	7,176	7,467	11,365	7,367	6,710
70	11,911	14,900	14,500	14,500	14,500	14,500	8,921	8,416	9,632	11,366	8,026	7,434
80	14,542	14,900	14,500	14,500	14,500	14,500	10,960	9,437	10,590	11,366	9,675	10,087
90	14,900	14,900	14,500	14,500	14,500	14,500	11,760	11,760	14,900	11,367	11,347	14,029
100	14,900	14,900	14,500	14,500	14,500	14,500	14,900	14,900	14,900	14,900	14,900	14,900
Mean	9,962	10,577	11,723	12,852	12,324	11,268	7,284	6,842	8,164	9,603	6,979	7,575

Table 3A-18. DeltaSOS Mean Annual Simulation Output for Alternative 3 under Cumulative Conditions

Water Year	Sac Basin Year Type	Available for DW Diversion (TAF)	Delta Storage (TAF)	Delta Storage Diversion (TAF)	Delta Storage Export (TAF)	Delta Storage Outflow (TAF)	Final Total Export (TAF)	Final QWEST Flow (TAF)	Final Delta Outflow (TAF)	3-Mile Slough Flow (TAF)	Old River Diversion Flow (TAF)	Final Antioch Flow (TAF)	Old & Middle Flow (TAF)
1922	2	276	207	276	204	0	7,405	(443)	11,054	2,840	1,587	2,397	(6,317)
1923	3	1,512	406	405	424	0	7,651	(951)	9,387	2,728	1,369	1,778	(6,776)
1924	5	0	0	0	0	0	4,582	(1,144)	4,166	1,626	825	482	(4,416)
1925	4	597	333	362	321	0	6,324	(1,271)	7,688	2,506	852	1,234	(5,949)
1926	4	201	186	201	176	0	6,173	(1,476)	6,583	2,364	877	888	(5,834)
1927	1	1,966	406	452	397	0	7,922	(1,497)	15,946	4,555	1,038	3,058	(7,363)
1928	2	1,827	406	733	698	0	8,109	(2,066)	12,487	4,063	996	1,998	(7,660)
1929	5	0	0	0	0	0	4,604	(901)	4,558	1,581	851	681	(4,359)
1930	4	85	86	85	90	0	5,322	(1,303)	5,963	2,126	764	823	(5,118)
1931	5	0	0	0	0	0	3,363	(297)	3,692	1,050	831	753	(3,142)
1932	4	0	0	0	0	0	4,467	15	5,556	1,308	943	1,323	(4,037)
1933	5	0	0	0	0	0	3,722	(344)	4,295	1,216	853	872	(3,486)
1934	5	0	0	0	0	0	3,900	(560)	4,716	1,431	805	871	(3,695)
1935	3	335	338	335	362	0	6,656	(1,050)	8,799	2,645	1,100	1,595	(6,054)
1936	3	1,139	406	404	363	0	6,862	(588)	10,153	2,707	1,192	2,119	(6,133)
1937	3	657	406	439	371	0	6,571	70	8,931	2,061	1,494	2,131	(5,522)
1938	1	7,367	406	458	368	0	9,078	2,990	34,025	6,311	3,087	9,301	(6,365)
1939	4	203	207	203	201	0	6,361	(1,758)	5,105	2,179	995	421	(5,991)
1940	2	2,040	406	425	384	0	7,493	(989)	16,587	4,422	1,046	3,433	(6,849)
1941	1	5,158	406	430	380	0	7,877	1,323	28,901	6,026	2,157	7,349	(6,068)
1942	1	4,083	406	545	474	0	8,787	(89)	24,887	5,868	1,534	5,778	(7,699)
1943	1	3,664	406	419	373	0	8,155	651	18,133	3,892	1,611	4,543	(7,042)
1944	4	0	0	0	0	0	6,067	(1,277)	6,408	2,216	984	939	(5,645)
1945	3	656	333	362	272	0	6,980	(1,154)	7,754	2,461	1,254	1,307	(6,260)
1946	3	1,795	406	400	424	0	7,317	(1,041)	12,043	3,402	1,139	2,360	(6,752)
1947	4	0	0	0	0	0	6,070	(1,596)	5,572	2,198	958	603	(5,724)
1948	3	0	0	0	0	0	6,409	(1,512)	7,327	2,560	806	1,048	(6,183)
1949	4	254	259	254	225	0	6,161	(1,511)	6,670	2,407	842	895	(5,908)
1950	3	21	22	21	20	0	6,526	(1,511)	7,228	2,537	866	1,026	(6,249)
1951	2	4,506	406	417	366	0	8,198	500	18,780	4,124	1,430	4,624	(7,241)
1952	1	4,683	406	491	368	0	9,257	536	25,358	5,634	1,548	6,170	(8,118)
1953	1	1,920	406	470	519	0	7,992	(1,846)	14,762	4,474	1,084	2,628	(7,464)
1954	2	1,497	406	597	549	0	8,684	(2,859)	12,577	4,521	908	1,662	(8,383)
1955	4	319	324	319	338	0	6,821	(2,177)	5,495	2,495	839	318	(6,537)
1956	1	4,551	406	438	381	0	8,242	924	25,708	5,504	1,711	6,428	(6,951)
1957	2	361	206	361	325	0	7,693	(2,157)	8,778	3,250	964	1,093	(7,308)
1958	1	5,034	406	458	368	0	9,685	319	29,887	6,803	2,019	7,122	(7,985)
1959	3	1,192	406	597	582	0	7,334	(2,034)	8,608	3,145	997	1,110	(6,929)
1960	4	0	0	0	0	0	6,037	(1,803)	5,907	2,389	802	586	(5,834)
1961	4	45	41	45	34	0	6,016	(1,938)	5,795	2,436	763	498	(5,839)
1962	3	679	333	362	314	0	6,283	(1,459)	7,626	2,598	892	1,139	(5,925)
1963	1	2,090	406	769	686	0	8,801	(2,226)	16,500	5,080	1,021	2,854	(8,225)
1964	4	756	400	661	660	0	7,161	(2,591)	5,787	2,792	849	201	(6,927)
1965	1	2,635	406	502	467	0	7,761	(360)	18,794	4,599	1,246	4,240	(7,034)
1966	3	726	406	502	500	0	7,813	(2,347)	7,577	3,074	1,110	727	(7,286)
1967	1	3,093	406	460	368	0	9,379	(632)	19,219	4,840	1,729	4,208	(8,040)
1968	3	1,224	406	591	523	0	8,003	(2,556)	9,516	3,641	943	1,085	(7,641)
1969	1	5,107	406	581	370	0	9,026	2,908	26,787	4,670	3,097	7,579	(6,341)
1970	1	4,602	406	274	335	0	8,154	716	24,999	5,457	1,632	6,173	(7,025)
1971	1	2,194	406	704	655	0	8,455	(1,851)	14,973	4,524	993	2,673	(7,990)
1972	3	76	78	76	72	0	7,295	(2,479)	6,651	2,934	902	455	(7,029)
1973	2	3,239	406	415	362	0	8,210	(635)	17,747	4,496	1,204	3,861	(7,353)
1974	1	5,063	406	431	368	0	9,010	(81)	29,865	7,025	1,154	6,945	(8,339)
1975	1	1,805	406	522	438	0	8,971	(1,617)	14,438	4,272	1,176	2,655	(8,330)
1976	5	131	130	131	126	0	5,673	(1,917)	4,874	2,213	755	297	(5,577)
1977	5	0	0	0	0	0	3,103	(453)	3,657	1,129	676	676	(3,077)
1978	2	2,136	406	420	368	0	6,694	(43)	15,015	3,536	1,158	3,494	(5,913)
1979	3	488	406	411	367	0	7,445	(1,304)	8,616	2,742	1,220	1,438	(6,734)
1980	2	4,574	406	409	372	0	7,531	2,371	21,655	3,769	2,567	6,140	(5,396)
1981	4	271	276	271	280	0	7,297	(2,110)	6,939	2,797	1,068	687	(6,828)
1982	1	7,159	406	678	375	0	9,673	4,270	34,290	5,670	3,355	9,940	(6,645)
1983	1	19,194	406	308	38	0	10,676	16,083	58,633	4,881	9,324	20,964	(1,539)
1984	1	7,829	406	22	334	0	8,413	4,728	26,785	3,683	3,669	8,411	(5,289)
1985	4	1,004	406	411	417	0	7,259	(1,883)	7,209	2,733	1,103	850	(6,697)
1986	1	5,490	406	439	369	0	7,514	3,701	26,814	4,240	2,756	7,942	(5,120)
1987	4	0	0	0	0	0	5,945	(1,382)	5,801	2,135	919	753	(5,639)
1988	5	218	223	218	230	0	4,906	(1,384)	4,744	1,887	685	503	(4,797)
1989	4	24	25	24	3	0	5,536	(1,562)	6,416	2,375	646	813	(5,483)
1990	5	0	0	0	0	0	4,159	(880)	4,572	1,572	633	692	(4,117)
1991	5	0	0	0	0	0	3,852	(583)	4,859	1,477	634	894	(3,816)
Average		1,996	272	314	282	0	7,041	(448)	13,252	3,356	1,369	2,908	(6,191)

Notes: Definitions of the categories are provided in Table A2-3 in Appendix 2.
Water-year types: 1=wet, 2=above normal, 3=below normal, 4=dry, 5=critically dry.
Negative values shown in parentheses.

Table 3A–19. Monthly Percentiles for DeltaSOS Simulations for Alternative 3 under Cumulative Conditions

DW diversion (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	29	59	0	0	0	0	0	0	0
60	0	0	0	29	61	0	0	0	0	0	0	0
70	0	0	822	632	61	98	0	0	0	0	0	0
80	0	517	1,260	3,390	729	98	151	0	0	0	0	0
90	2,847	4,949	4,914	5,499	2,945	399	151	198	0	0	0	0
100	6,000	6,000	6,000	6,000	6,000	4,951	2,939	1,791	235	260	0	3,888
Mean	526	848	1,117	1,295	796	305	127	55	17	4	0	125

DW storage (TAF)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	(0)	0	(0)	(0)	(0)	0	(0)	(0)	(0)	0
10	0	0	0	0	0	(0)	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	52	0	0	0	0	0	0	0
50	0	0	0	276	189	31	16	0	0	0	0	0
60	0	0	52	369	333	240	266	207	0	0	0	0
70	0	81	278	406	406	406	389	315	14	0	0	0
80	0	149	406	406	406	406	397	385	179	0	0	0
90	200	357	406	406	406	406	406	406	330	21	0	0
100	406	406	406	406	406	406	406	406	406	406	353	406
Mean	44	84	137	210	205	175	174	159	72	15	5	12

DW discharge for export (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	683	0	0	0
80	0	0	0	0	329	1,031	0	67	3,583	1,454	0	0
90	0	0	1,296	0	3,851	2,922	167	636	5,878	3,463	112	0
100	0	2,518	4,215	2,703	6,000	6,000	895	3,000	6,000	6,000	3,938	0
Mean	0	159	255	90	841	732	61	204	1,352	861	127	0

DW discharge for outflow (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0
70	0	0	0	0	0	0	0	0	0	0	0	0
80	0	0	0	0	0	0	0	0	0	0	0	0
90	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0
Mean	0	0	0	0	0	0	0	0	0	0	0	0

Final CVP Tracy and SWP Banks exports (cfs)

Percentile	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	4,329	3,356	5,087	4,862	6,075	3,202	2,865	2,496	1,207	1,968	653	3,340
10	5,166	5,415	7,383	8,704	6,836	4,723	3,645	3,215	5,500	4,519	3,564	3,661
20	6,895	6,670	7,857	10,953	9,184	6,570	3,873	3,639	5,595	6,959	4,957	5,959
30	8,033	7,402	9,937	11,593	12,331	9,174	4,412	4,074	5,804	8,325	5,199	6,120
40	8,541	8,413	11,170	14,147	14,500	12,287	5,623	5,017	6,267	11,260	6,064	6,428
50	9,096	10,700	12,749	14,500	14,500	14,500	6,573	6,047	7,026	11,437	7,028	6,587
60	9,751	13,325	14,500	14,500	14,500	14,500	7,380	7,176	9,209	11,438	7,625	6,754
70	11,962	14,900	14,500	14,500	14,500	14,500	8,921	8,457	10,551	11,438	8,521	7,478
80	14,542	14,900	14,500	14,500	14,500	14,500	10,960	9,437	12,588	11,438	9,980	10,131
90	14,900	14,900	14,500	14,500	14,500	14,500	11,760	11,760	14,900	13,615	11,403	14,073
100	14,900	14,900	14,500	14,500	14,500	14,500	14,900	14,900	14,900	14,900	14,900	14,900
Mean	9,997	10,602	11,742	12,853	12,516	11,491	7,310	6,856	8,717	10,034	7,132	7,615

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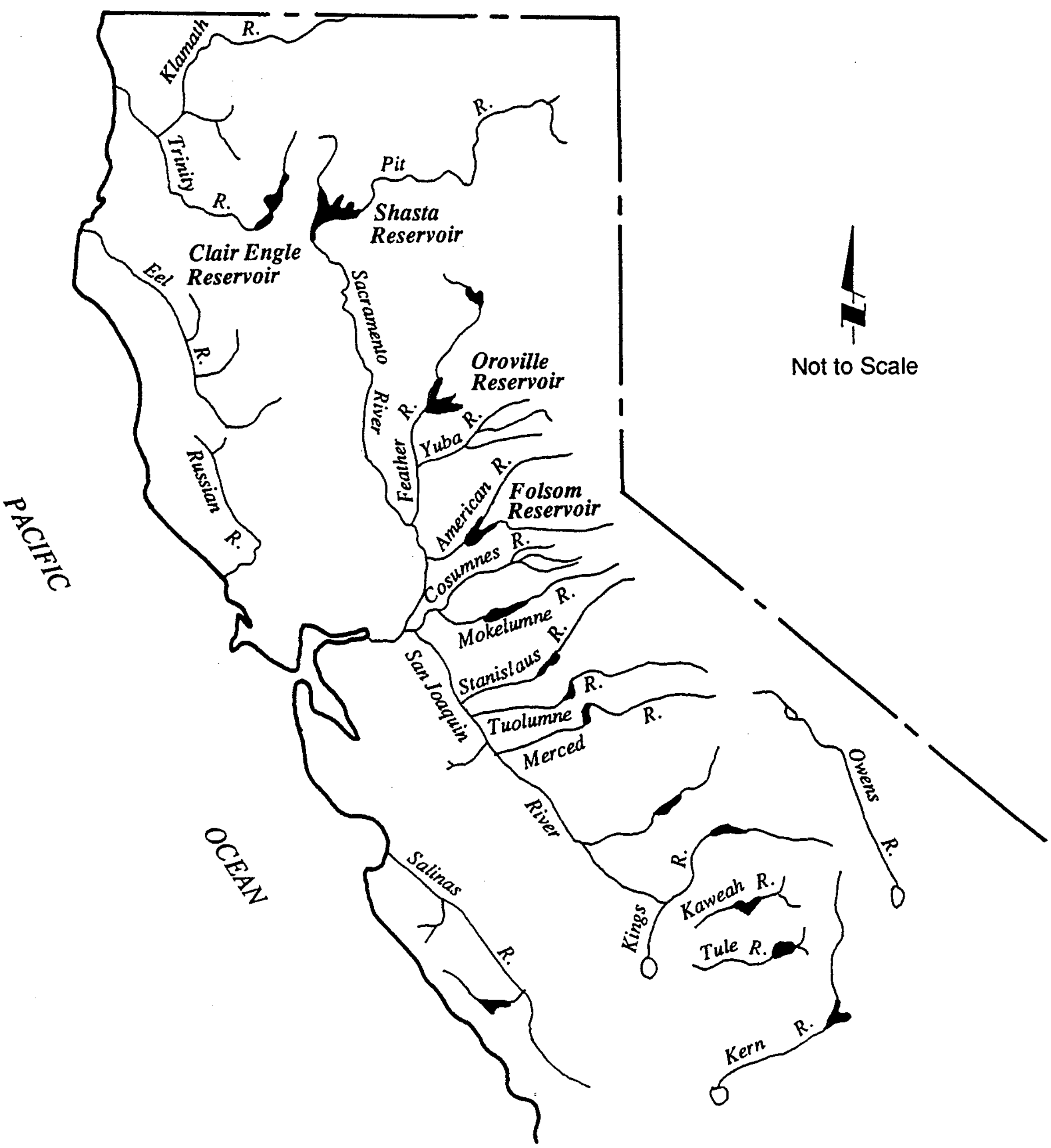

Figure 3A-1.
Upstream Reservoirs Included in the DWRSIM Statewide Water Supply Planning Model

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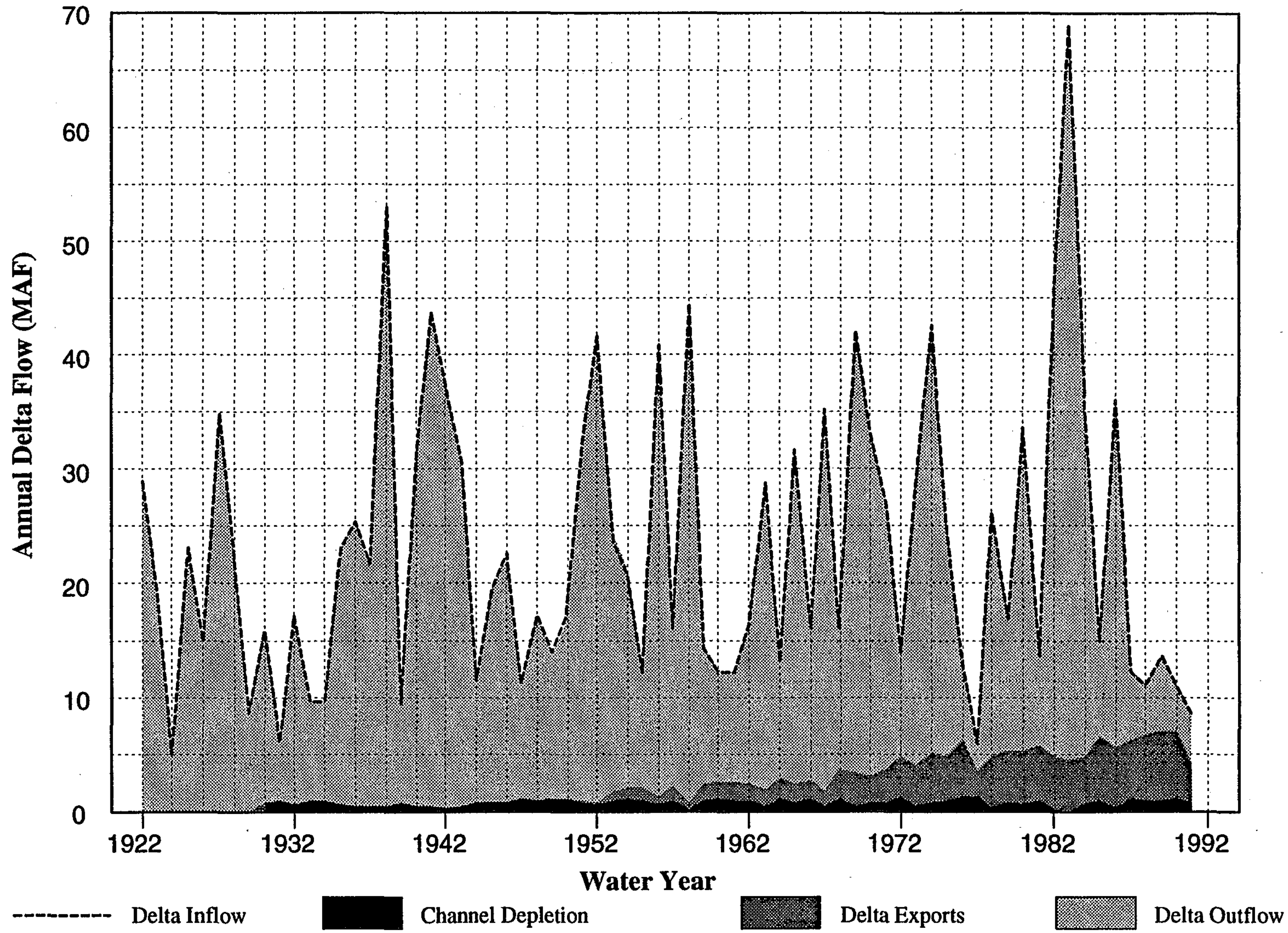

Figure 3A-2.
Historical Annual Delta Inflow, Channel Depletion, Delta Exports, and Delta Outflow for 1922-1991

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Prepared by: Jones & Stokes Associates

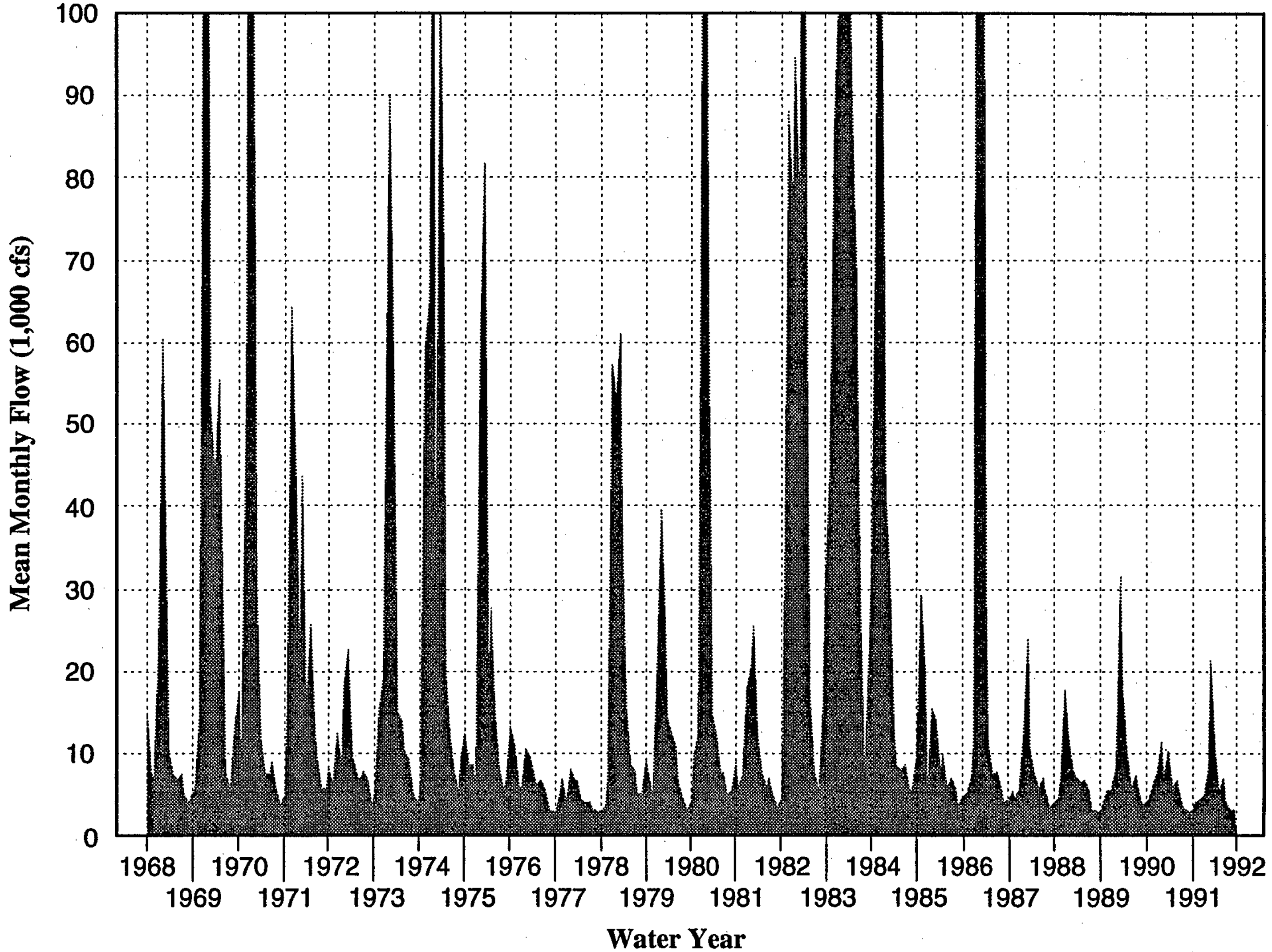

Figure 3A-3.
Historical Mean Monthly Delta Outflow for 1968-1991

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Prepared by: Jones & Stokes Associates

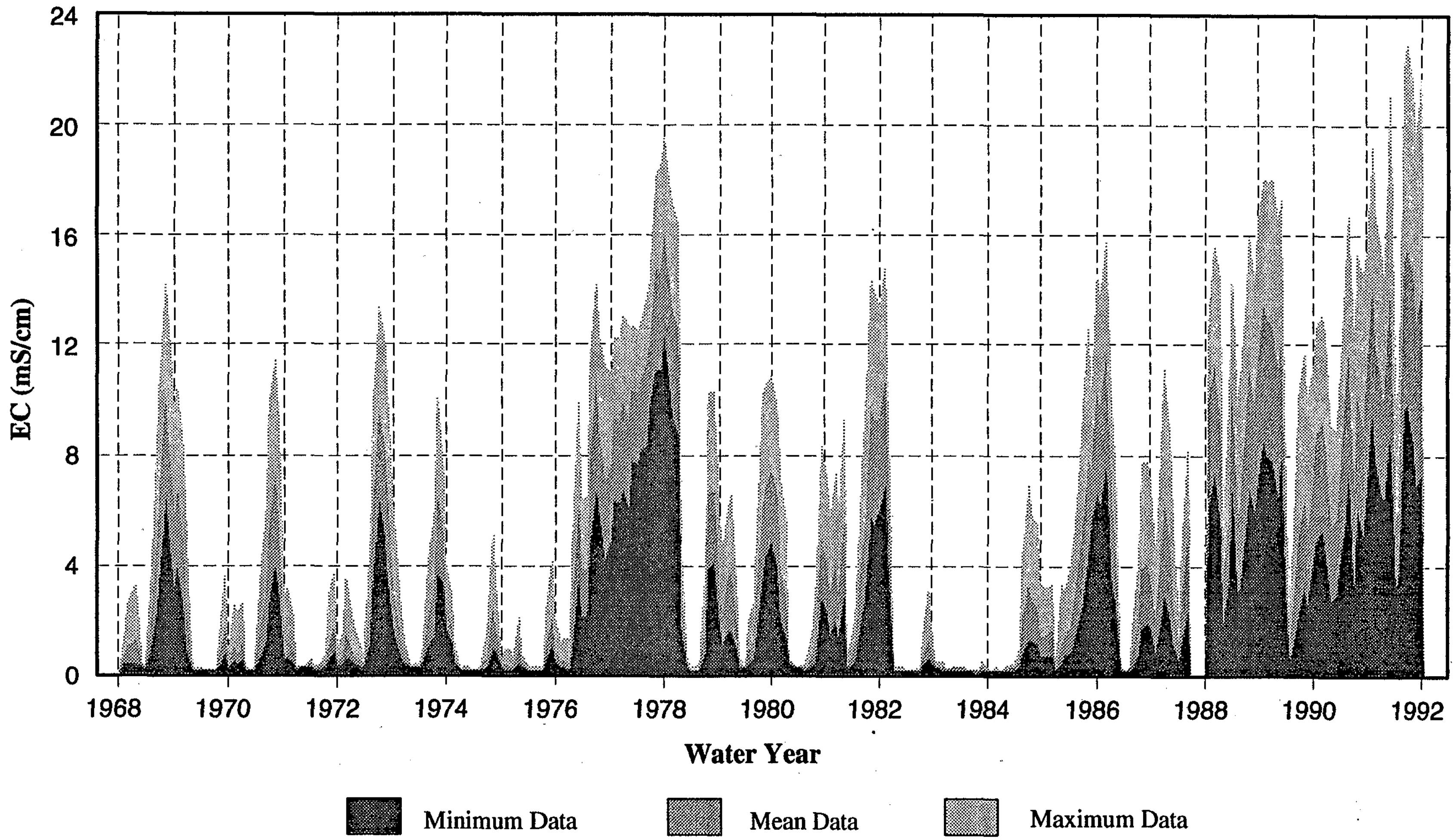

Figure 3A-4.
Historical Minimum, Mean, and Maximum Monthly
EC at Pittsburg for 1968-1991

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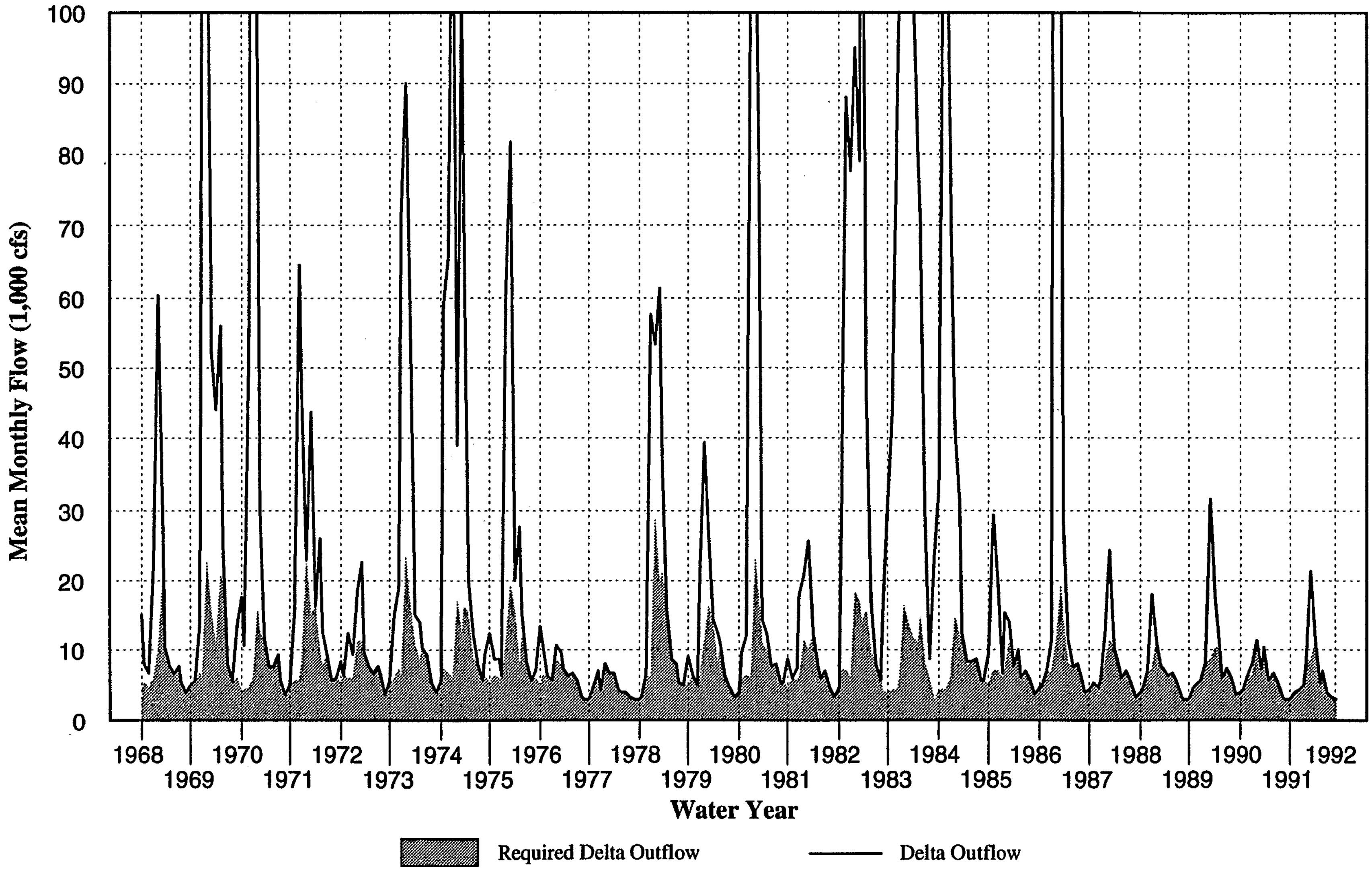

Figure 3A-5.
DeltaSOS-Simulated Mean Monthly Delta Outflow and Required Delta Outflow for 1968-1991 for the No-Project Alternative

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Prepared by: Jones & Stokes Associates

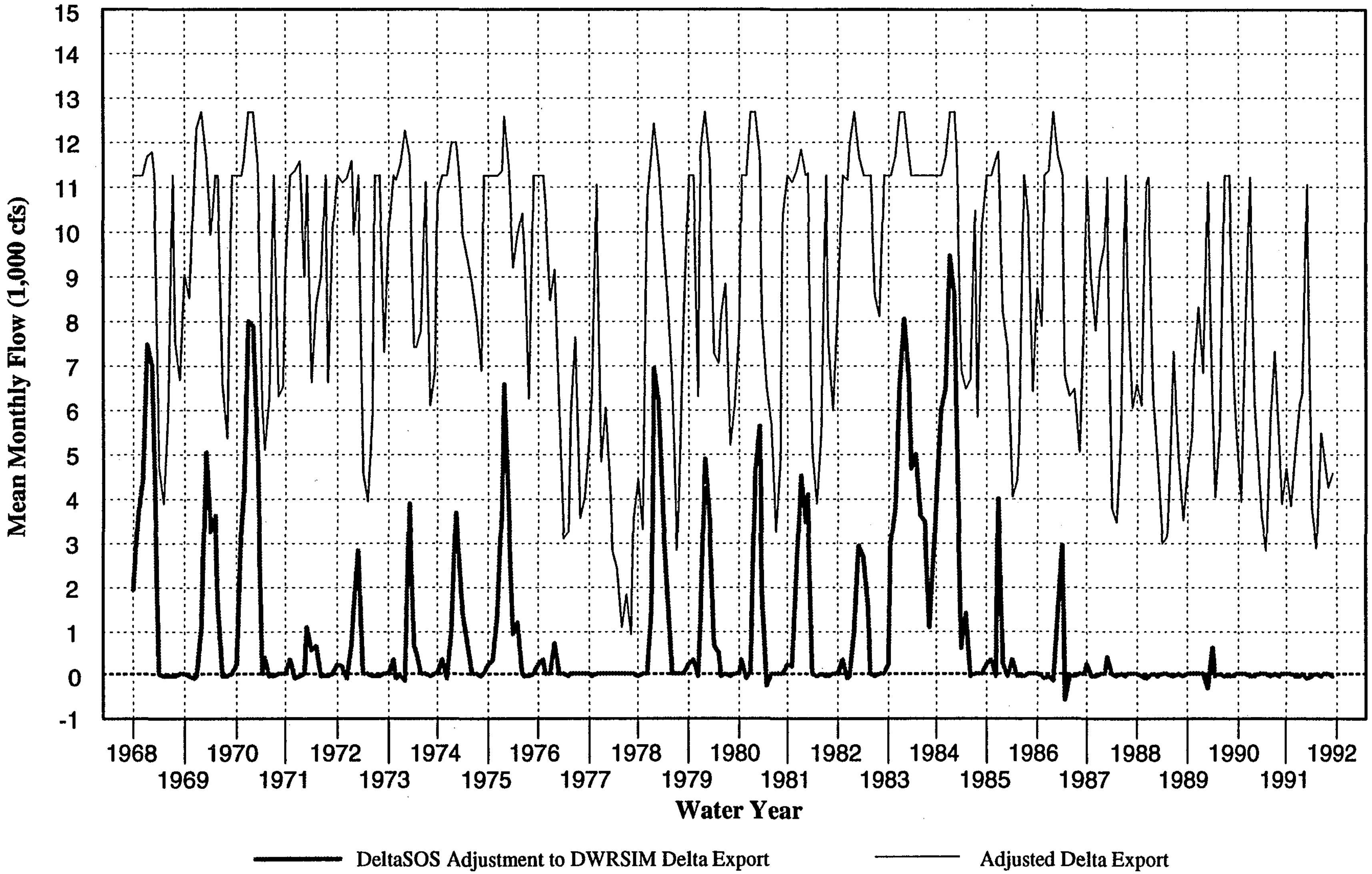

Figure 3A-6.
DeltaSOS-Simulated Mean Monthly Delta Export and Export Adjustment for 1968-1991 for the No-Project Alternative

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PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates

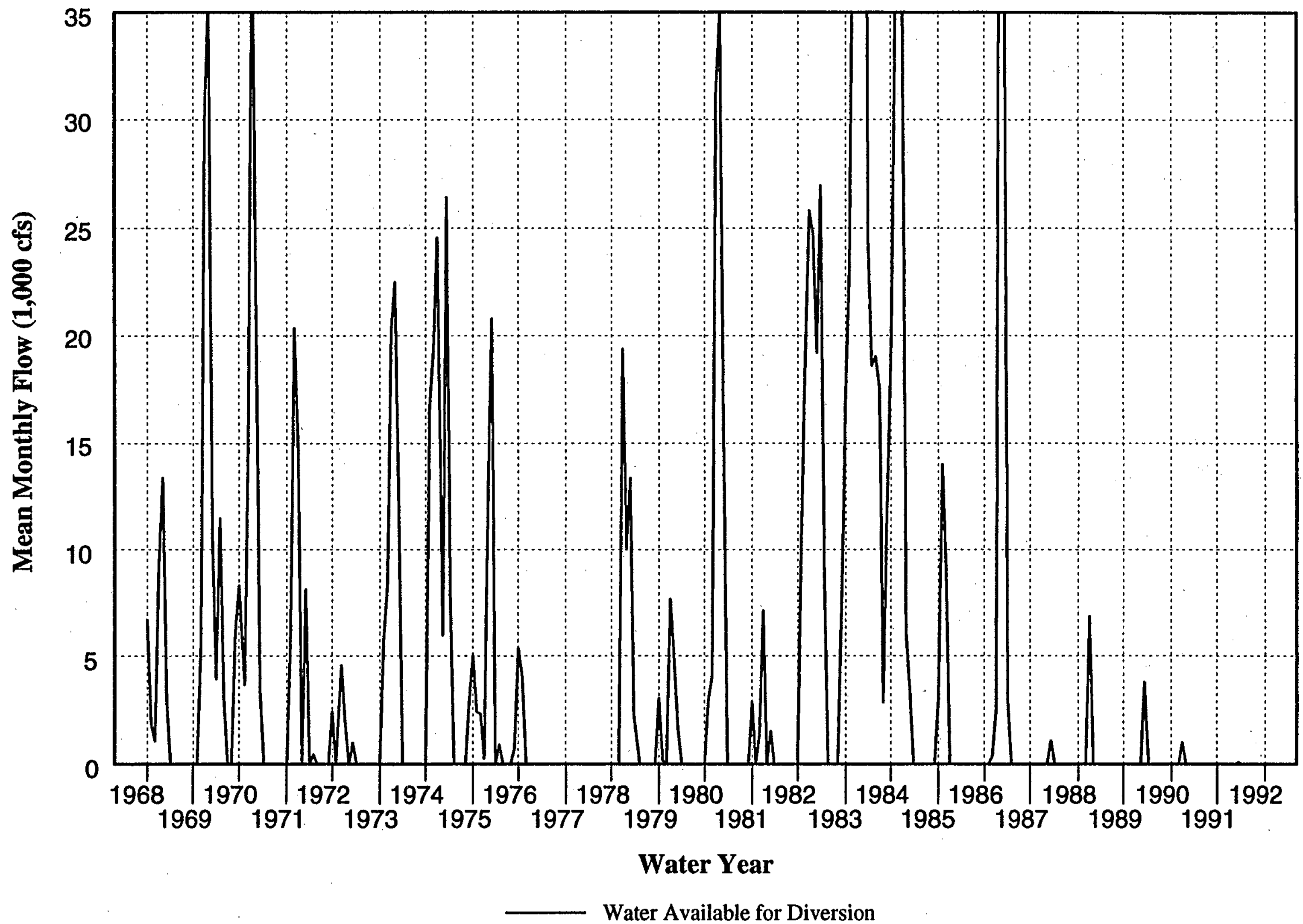
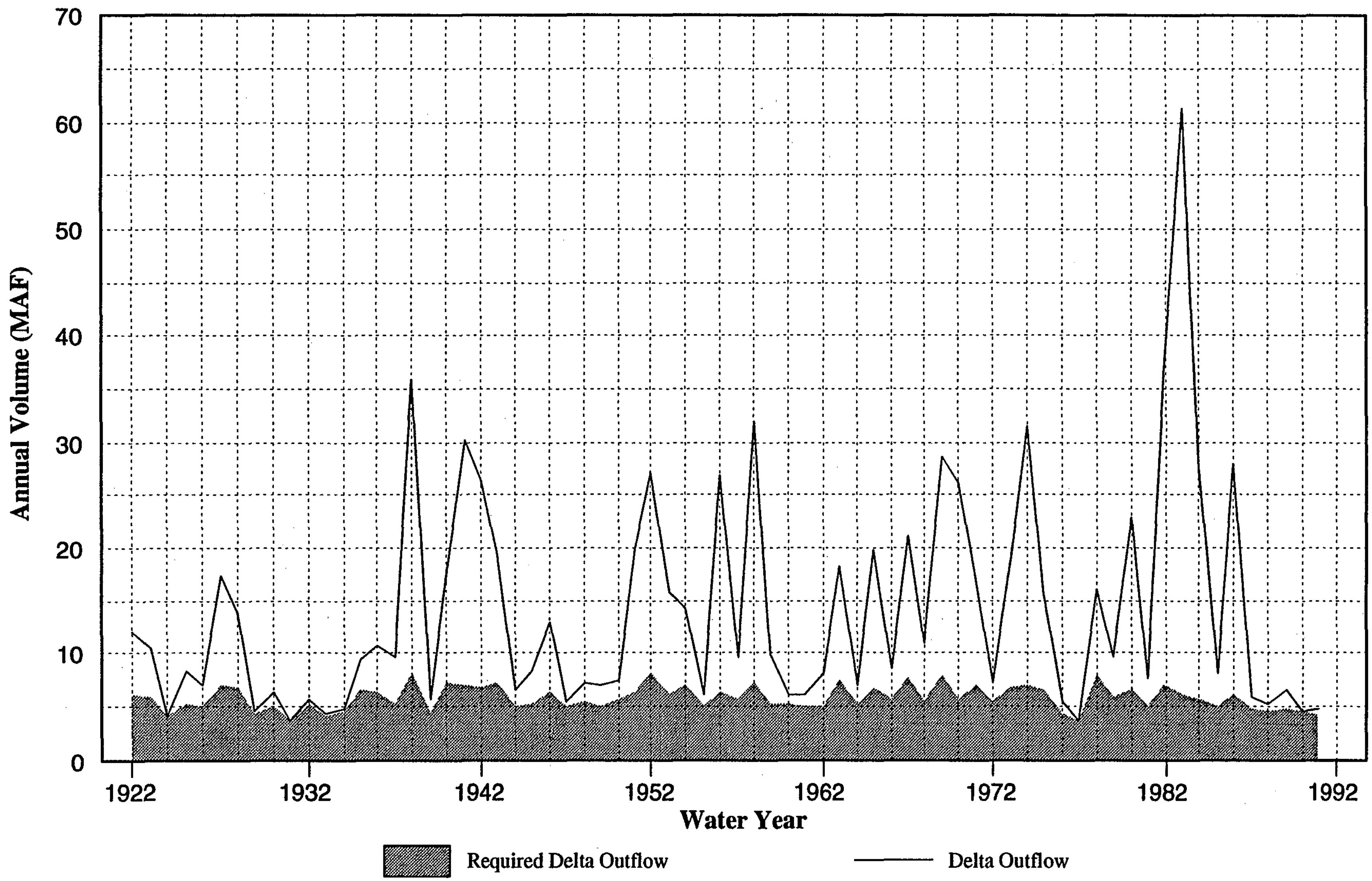


Figure 3A-7.
DeltaSOS-Simulated Mean Monthly Water Available
for DW Diversion for 1968-1991 for the No-Project Alternative

DELTA WETLANDS
PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates



C—060478

Figure 3A-8.
DeltaSOS-Simulated Annual Delta Outflow and Required Delta Outflow for 1922-1991 for the No-Project Alternative

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PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates

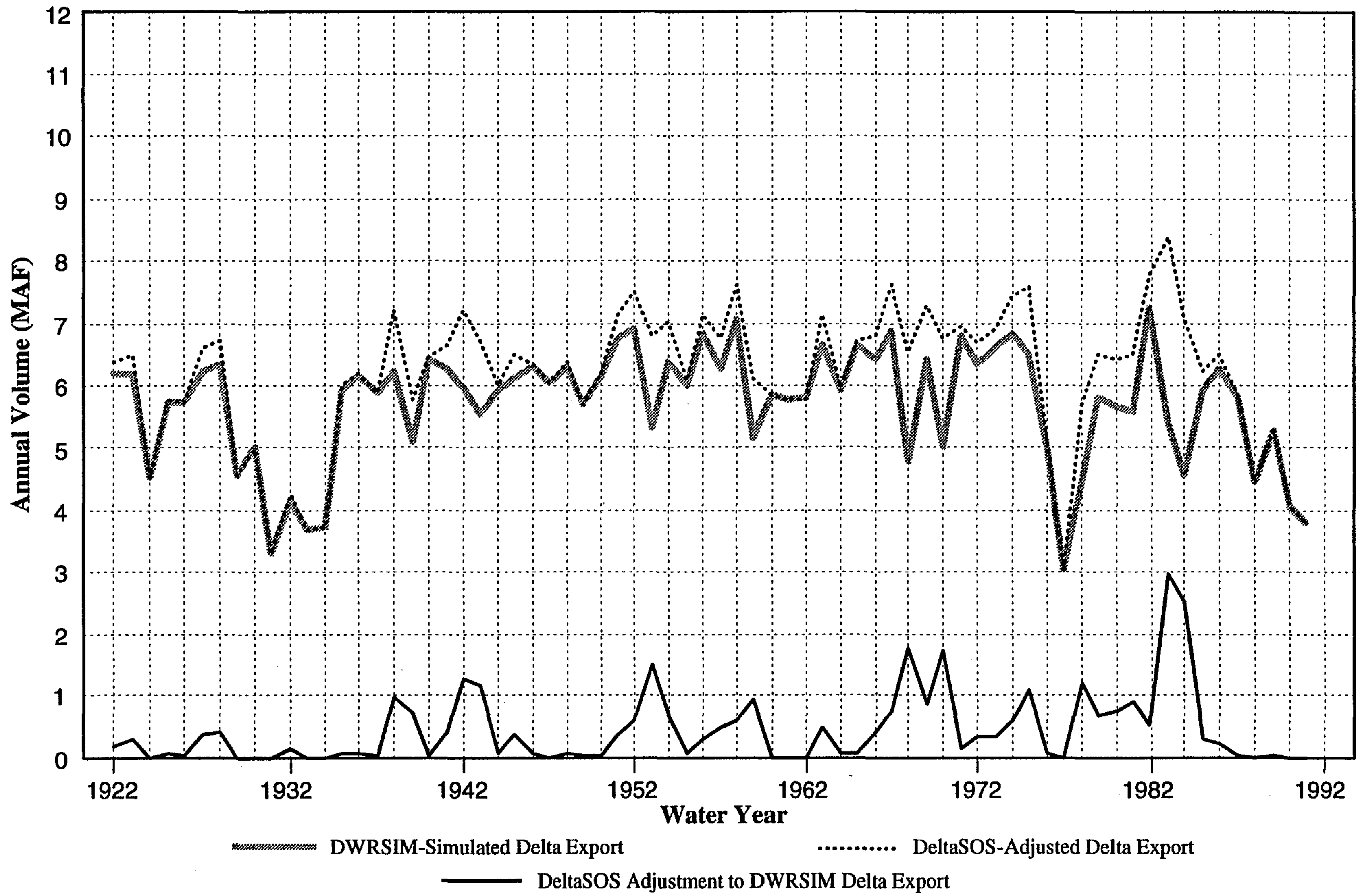

Figure 3A-9.
DWRSIM-Simulated and DeltaSOS-Adjusted Annual Delta Export for 1922-1991 for the No-Project Alternative

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Prepared by: Jones & Stokes Associates

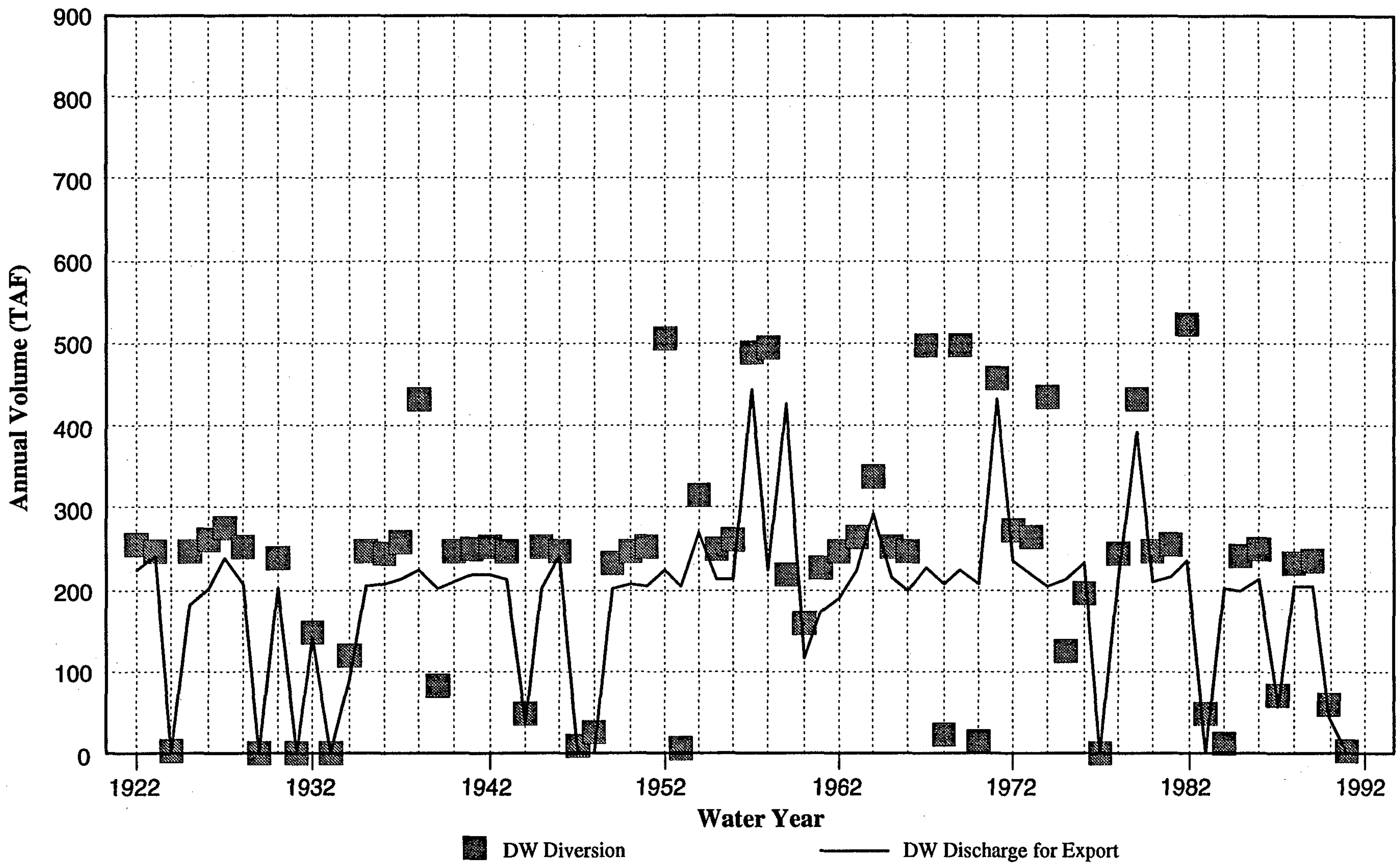

Figure 3A-10.
DeltaSOS-Simulated Annual DW Diversion and DW Discharge for Export for 1922-1991 for Alternative 1

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Prepared by: Jones & Stokes Associates

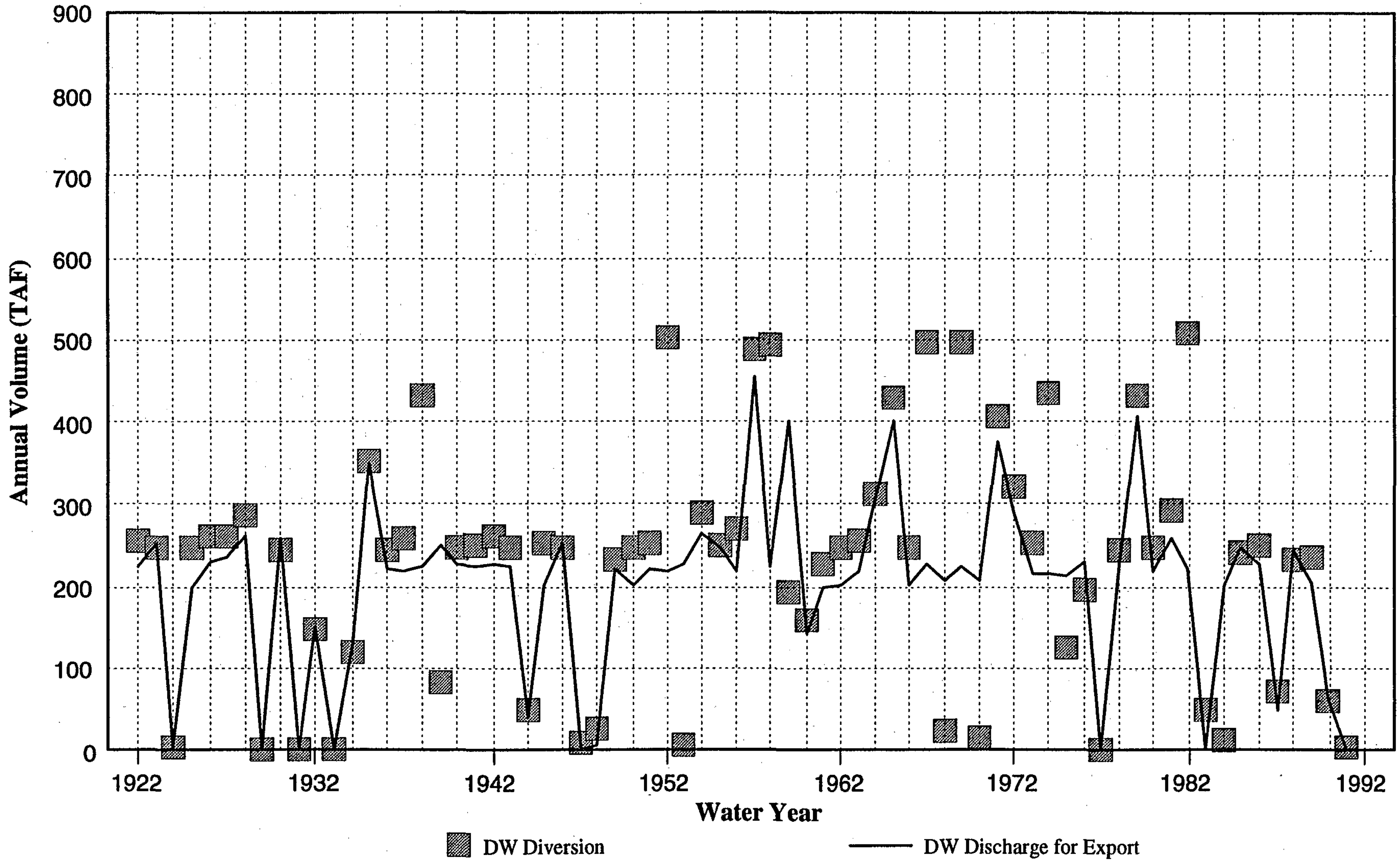

Figure 3A-11.
DeltaSOS-Simulated Annual DW Diversion and DW Discharge for Export for 1922-1991 for Alternative 2

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Prepared by: Jones & Stokes Associates

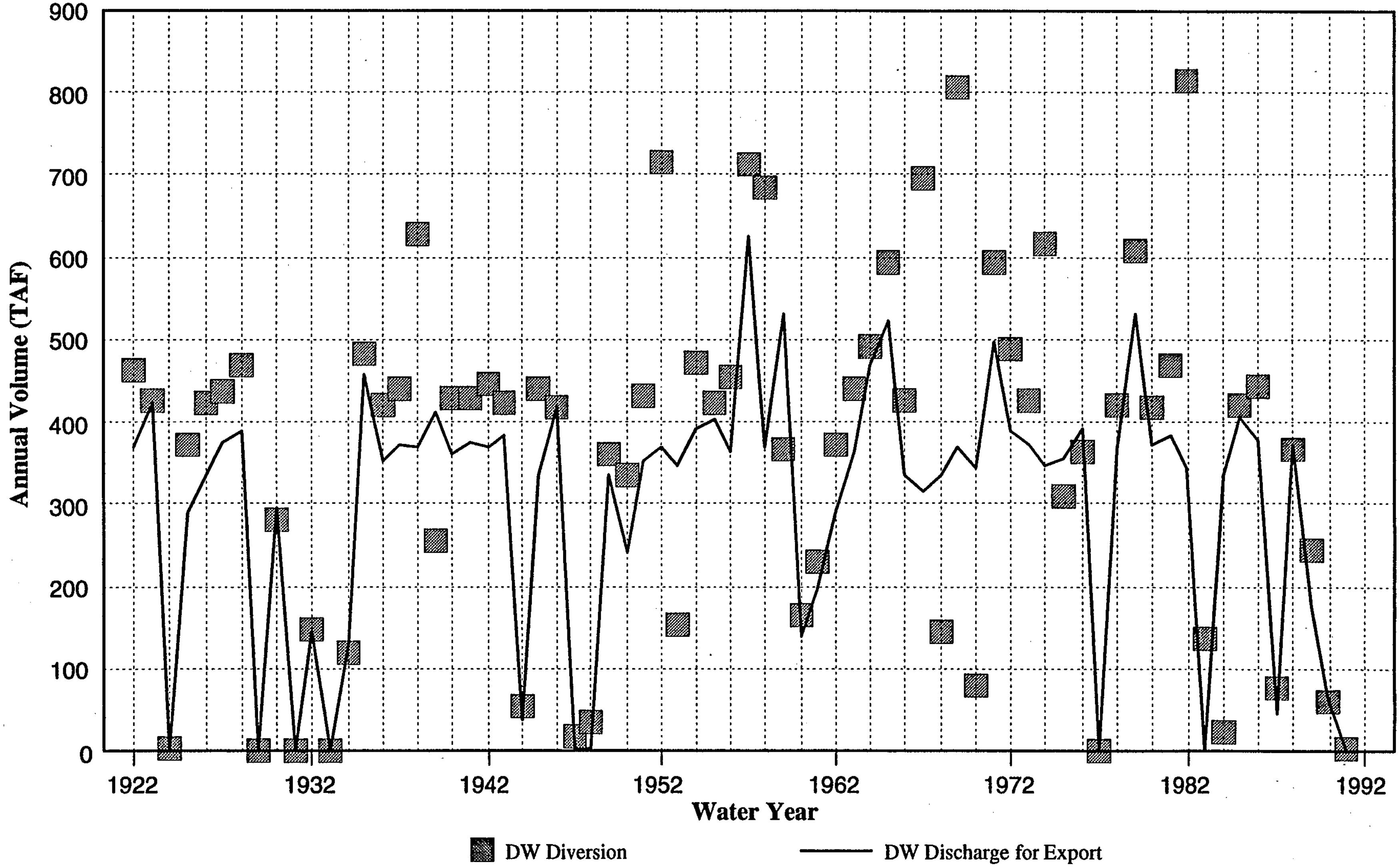

Figure 3A-12.
DeltaSOS-Simulated Annual DW Diversion and DW Discharge for Export for 1922-1991 for Alternative 3

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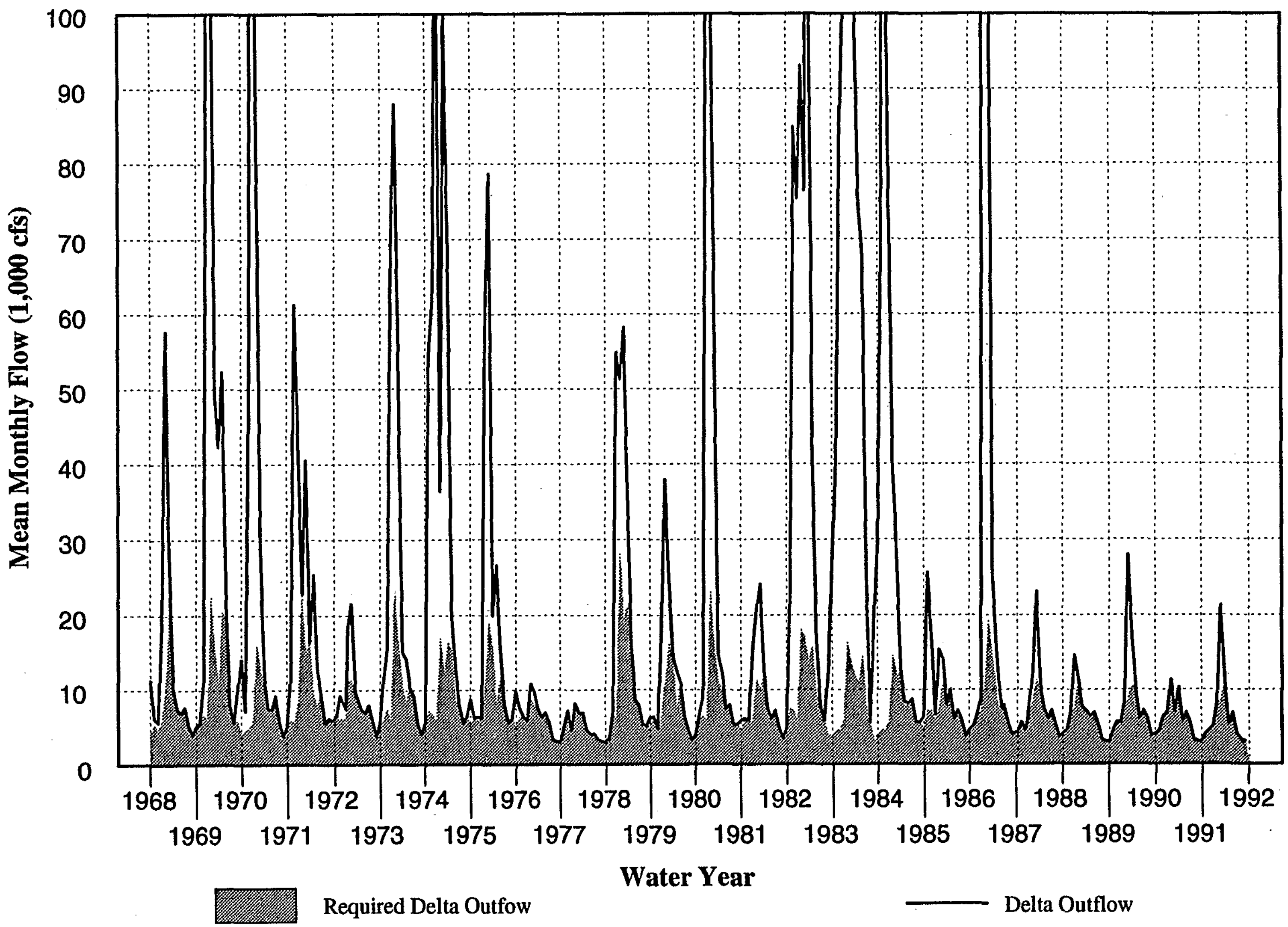

Figure 3A-13.
DeltaSOS-Simulated Mean Monthly Delta Outflow and Required Delta Outflow for 1968-1991 for the No-Project Alternative under Cumulative Conditions

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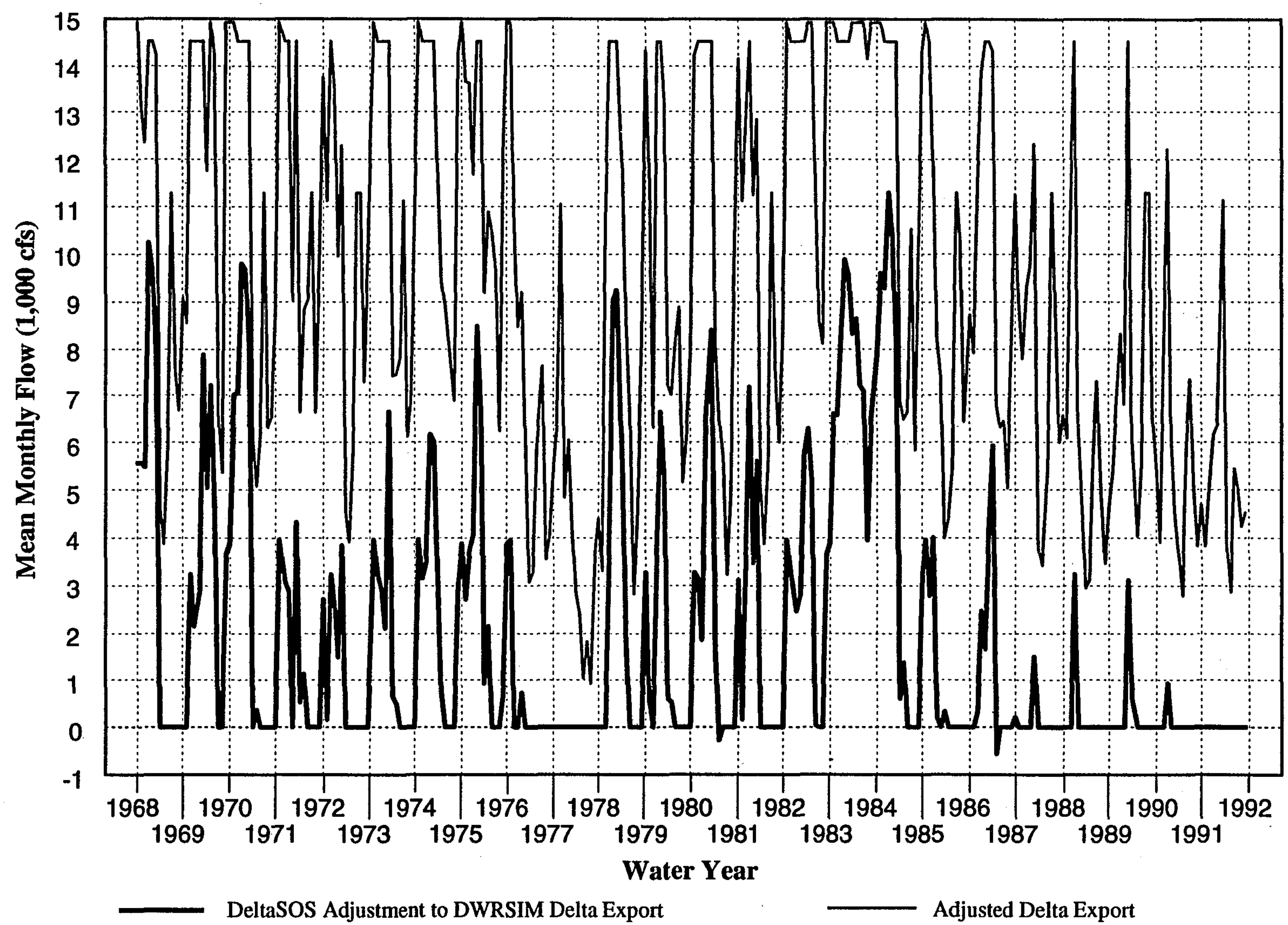

Figure 3A-14.
DeltaSOS-Simulated Mean Monthly Delta Export and Export Adjustment for 1968-1991 for the No-Project Alternative under Cumulative Conditions

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PROJECT EIR/EIS
Prepared by: Jones & Stokes Associates

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C-060484

C-060485

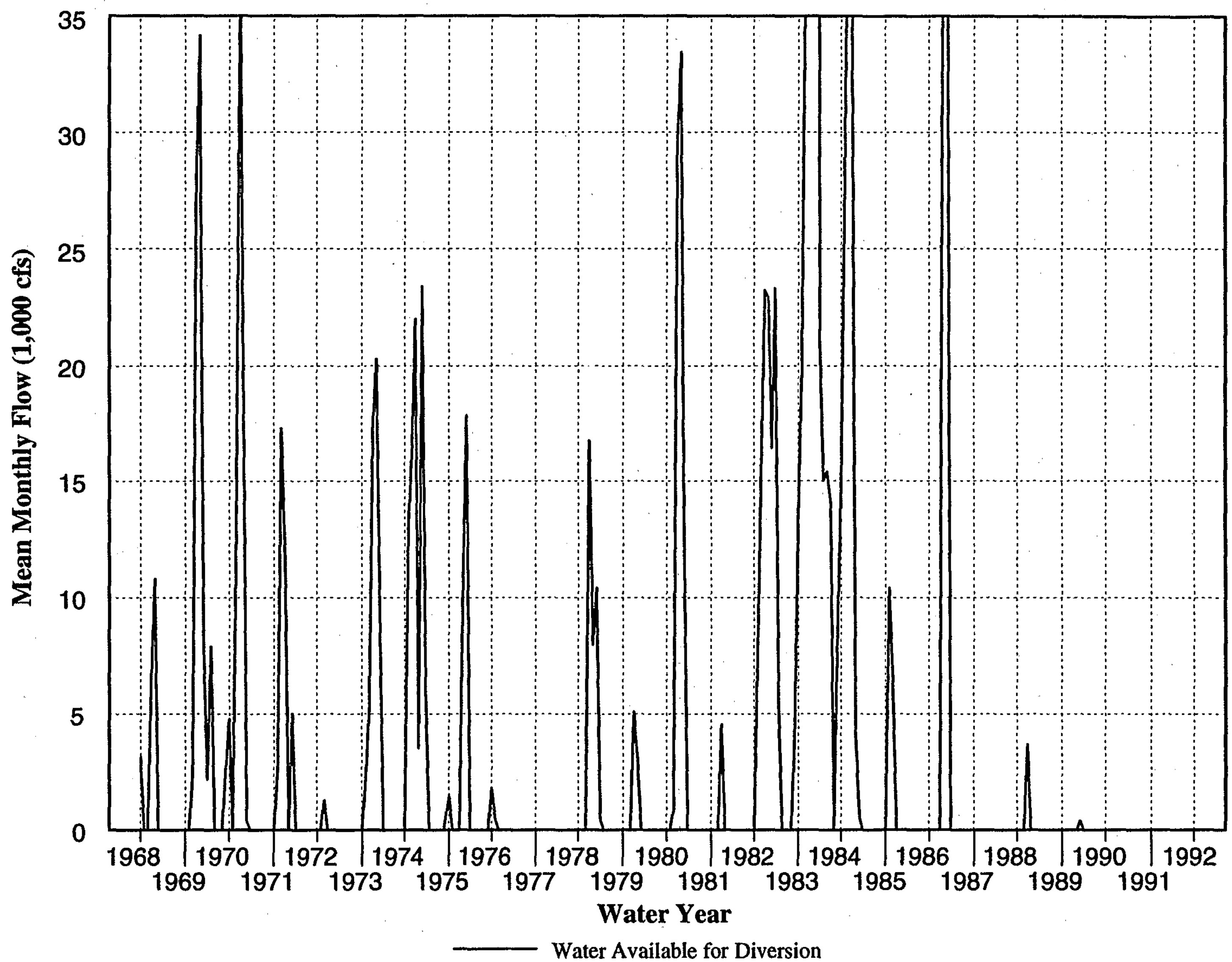

Figure 3A-15.
DeltaSOS-Simulated Mean Monthly Water Available for Diversion
for 1968-1991 for the No-Project Alternative under Cumulative Conditions

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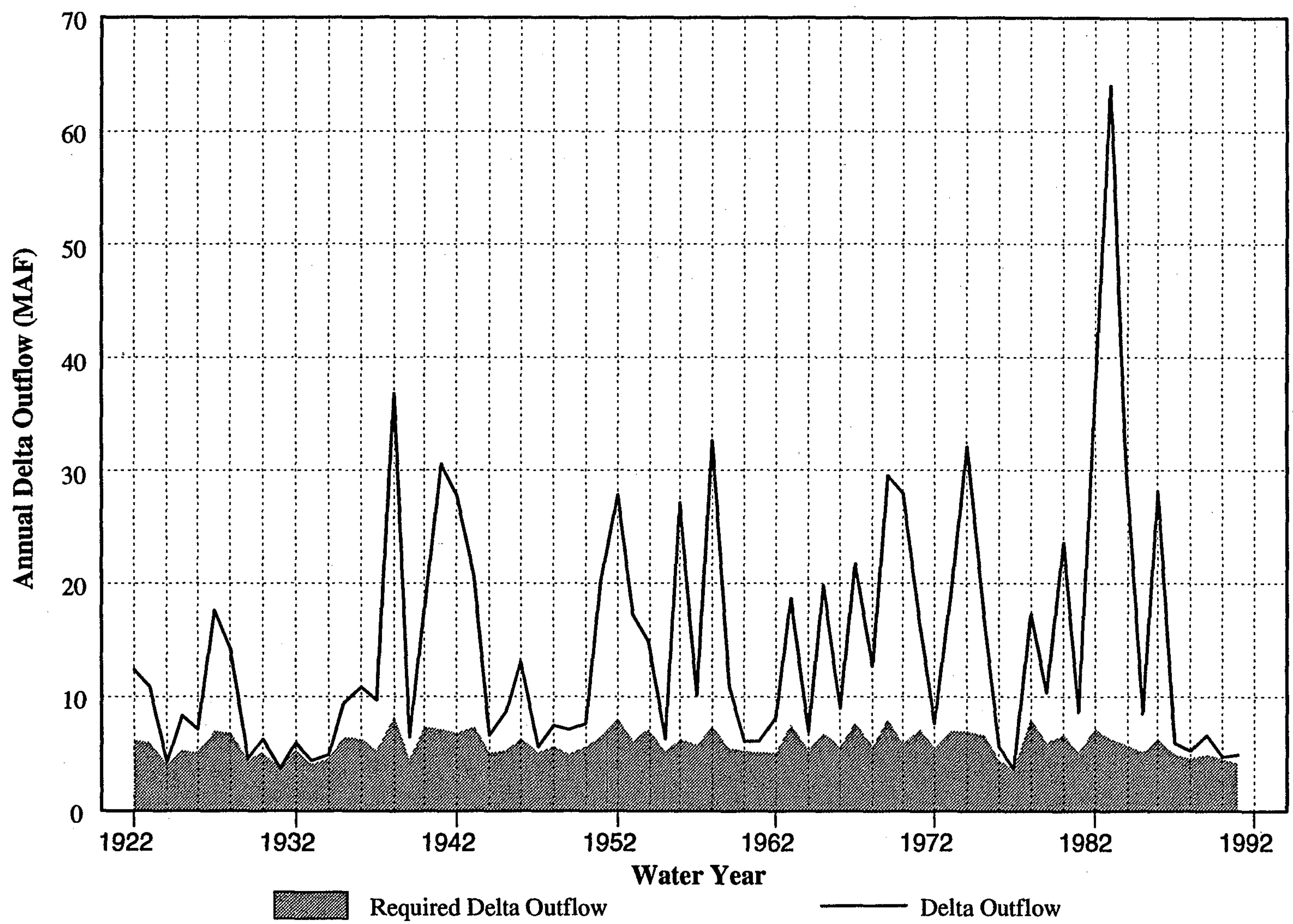

Figure 3A-16.
DeltaSOS-Simulated Annual Delta Outflow and Required Delta Outflow for 1922-1991 for the No-Project Alternative under Cumulative Conditions

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Prepared by: Jones & Stokes Associates

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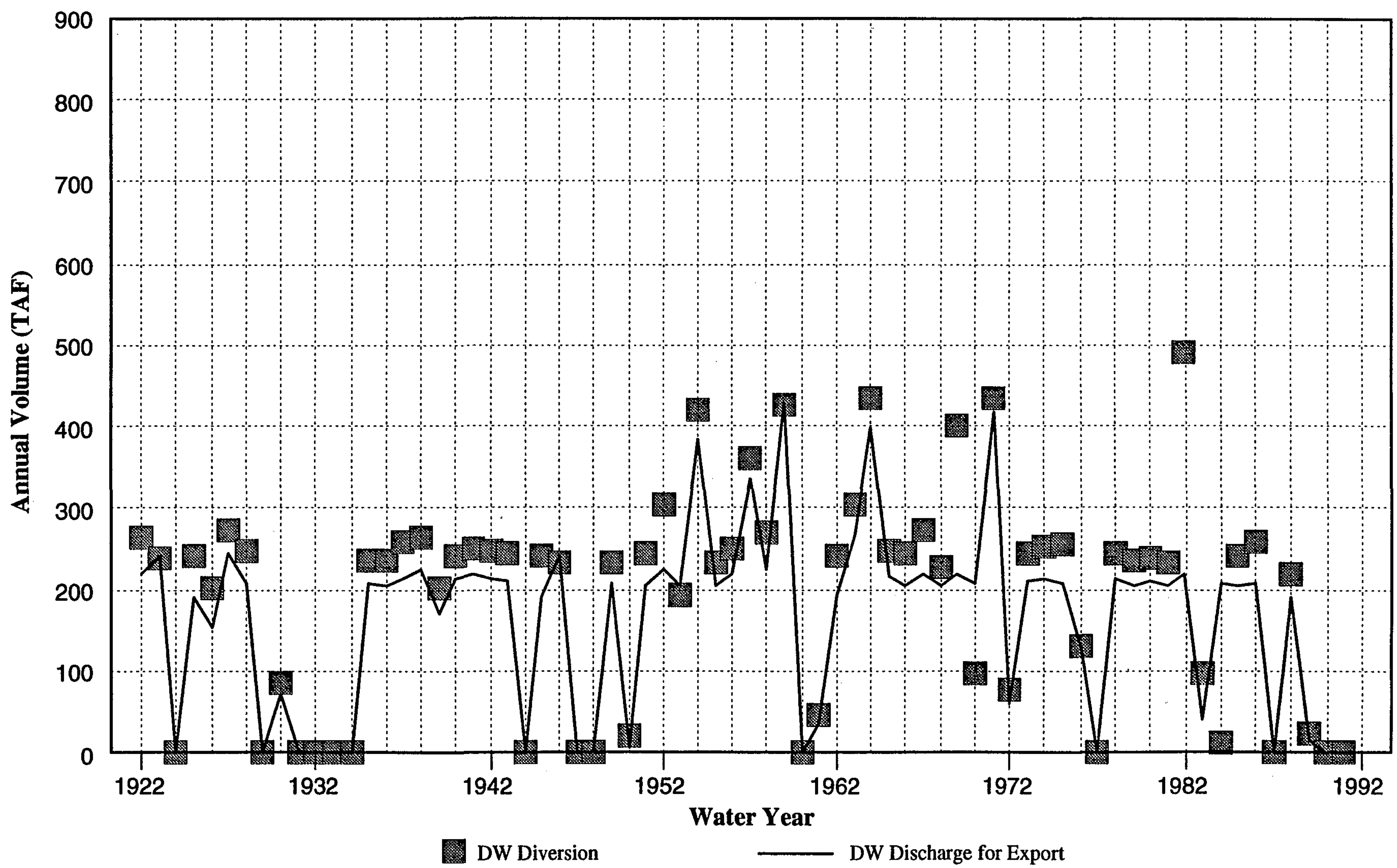

Figure 3A-17.
DeltaSOS-Simulated Annual DW Diversion and DW Discharge for Export for 1922-1991 for Alternative 1 under Cumulative Conditions

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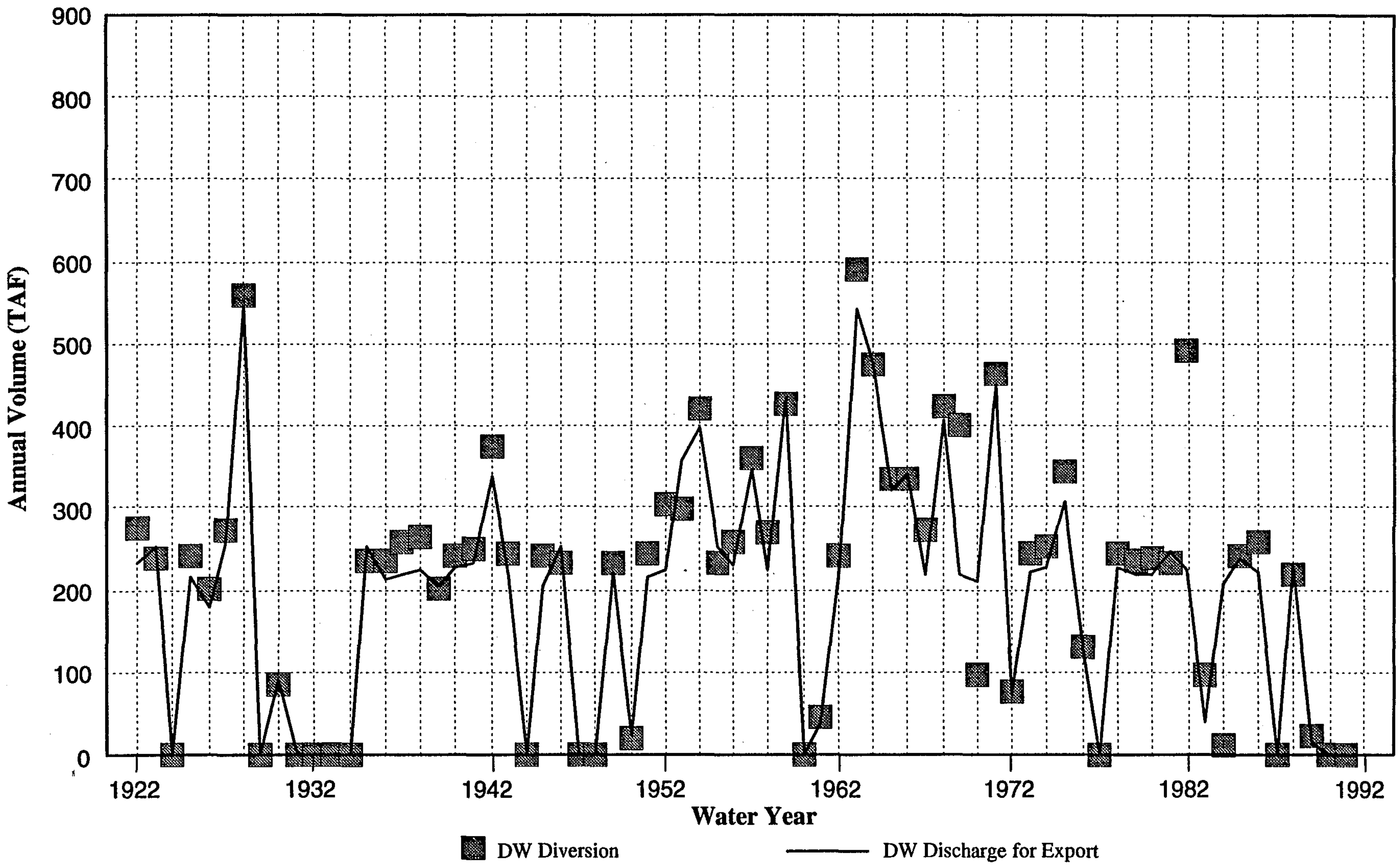

Figure 3A-18.
DeltaSOS-Simulated Annual DW Diversion and DW Discharge for Export for 1922-1991 for Alternative 2 under Cumulative Conditions

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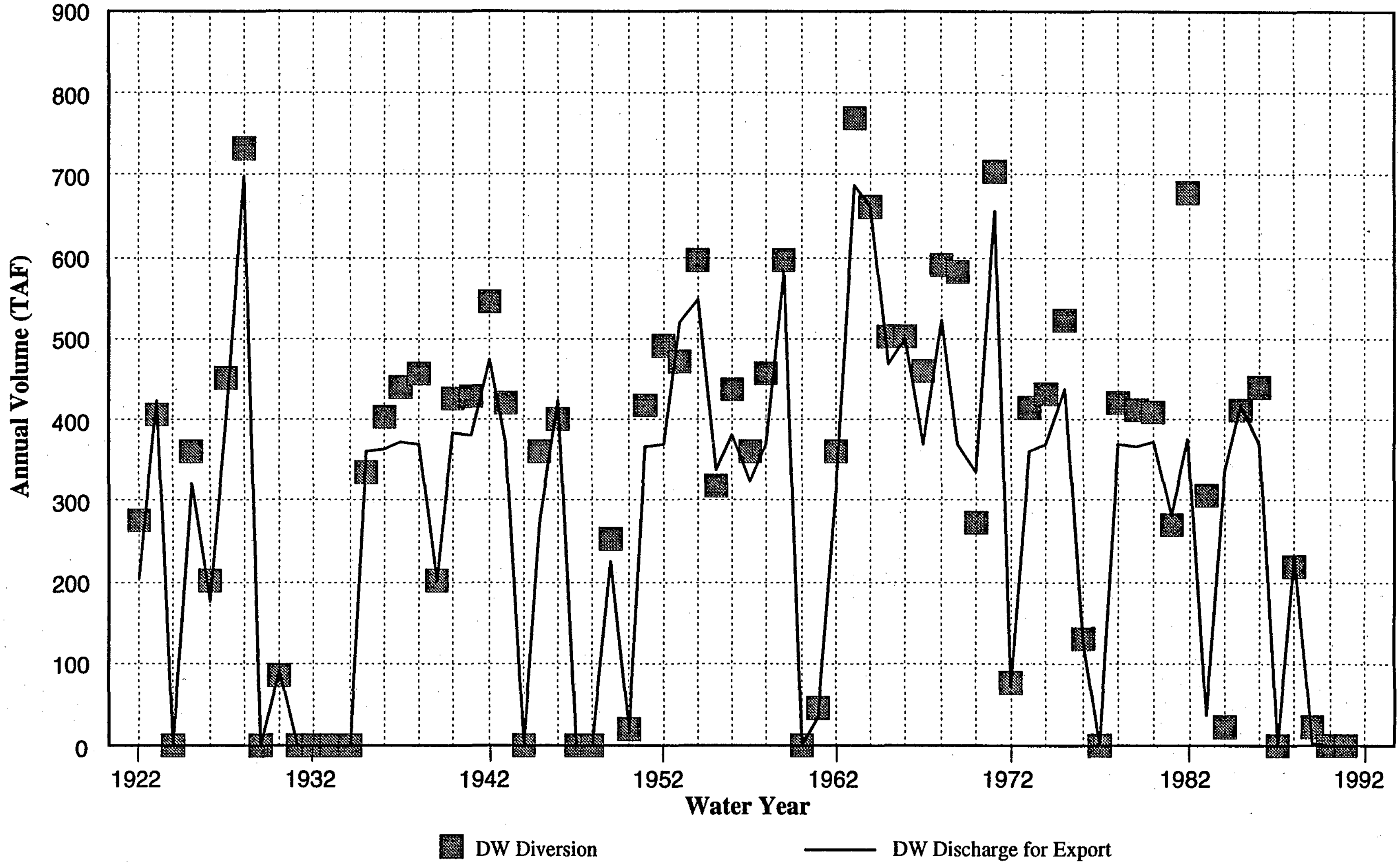

Figure 3A-19.
DeltaSOS-Simulated Annual DW Diversion and DW Discharge for Export for 1922-1991 for Alternative 3 under Cumulative Conditions

DELTA WETLANDS
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